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ABSTRACT

Different kinds of students experience the medical school environment in different ways, pay attention to different things, perceive the same events in different ways, and consequently make various kinds of career commitments. Who is affected by what kinds of experience to become what kind of physician? The taxonomic method used identifies different types of problem-solving systems of medical students and investigates their differential behavior in the medical school setting. The different types of problem-solving systems are identified on the basis of what are considered "personality" indices, such as: (1) extraversion vs. introversion; (2) rule-bound vs. unconstrained; (3) feeling vs. thinking; (4) divergence vs. conventionality of thought; and (5) anxiety vs. adjustment. Twelve relatively homogeneous types were identified in a group of medical students at the University of New Mexico School of Medicine. Definite patterns of characteristics emerged for the twelve types. (Author/KE)

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TYPES OF MEDICAL STUDENTS

By

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PREFACE

The research reported in this monograph constitutes partial validation of a set of assumptions about medical students: that there are different kinds of students, that these different types react to the medical school experience in different ways, and that the result is different career pathways and professional outcomes. Although the phenomenon of differential reactivity to experience is obvious to the casual observer, it is commonly ignored in research of the bi-variate (independent-dependent variable) variety. Partly this has been due to the difficulty in identifying, in a non-arbitrary and reproducible manner, kinds of human beings. The advent of multivariate statistical techniques for grouping or classifying individuals on the basis of many attributes all at once has at least made this problem approachable, even though the thorny conceptual problems remain. In part, this research is a demonstration of the practical and heuristic value of such techniques.

During the course of the research it became apparent that some kind of conceptual scheme was necessary which would embrace the diversity of phenomena considered and serve as a guide to future research. The discussion of "Man as Problem Solver" gives the broad outlines of such a scheme. Much of its further elaboration is dependent upon empirical studies since for the most part, it is "content free." As it now stands, it serves as a "backdrop" for contemplation of the findings.

The work could never have been completed in such a short time without the considerable assistance of a number of people. Special thanks are due the staff of the Longitudinal Study at the University of New Mexico School of Medicine. Joann Weiss patiently sifted the relevant literature and provoked thoughtful consideration of many issues which would otherwise have been ignored. Joshua Kaufman managed to get the data analyzed on computer despite many complexities and frustrations. Anita Frank helped to make the manuscript readable, resistances of the author notwithstanding. Kathleen Cary succeeded in getting the paper typed and printed in a very short time. The encouragement and assistance of the Project Director, John R. Graham, M.D., has been much appreciated if too infrequently expressed.

Many others have contributed to the success of the project, among them Mrs. Anna Ruth Crocker and Mr. Lewis C. Smith at the Bureau of Health, Manpower Education, National Institutes of Health, whose faith in the research program led to its initial funding. The continuing interest and support shown by members of the Division of Manpower Intelligence is also acknowledged.

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CHAPTER 1

INTRODUCTION

Although the ills of the American medical care delivery system have often been blamed on the health manpower shortage, the problem is not strictly one of quantity. Many other factors are involved, including the need to match the distribution and types of human resources with the distribution and types of health needs and the concurrent necessity of anticipating manpower requirements in the light of constant changes in the population, technology and the economic and political climate.

Medical schools have not addressed themselves directly to the problems of health manpower requirements. Instead, they have focused their attention on the selection and retention of "the best" applicants. Considerable data has been collected by researchers in the health professions on such questions as: "What kind of an applicant becomes a good medical student?" and "How does the process of professional socialization occur?". A few investigators have asked, "Does a good medical student become a good physician?". Unfortunately, these studies have, for the most part, not grappled with the problems of diversity in individual attributes and in demands of different work settings. Prediction of behavior and "niche" selection within the opportunity structures is difficult unless descriptive categories of role performance are specified and the varieties of individual "styles" recognized. It is to the issue of describing regularities in the

diversity that exists in a medical student population that this study addresses itself.

A few major trends in the literature dealing with medical students' characteristics will be briefly mentioned in order to point out some problem areas. Studies of intellectual abilities have focused on the prediction of academic performance. Medical students are reported to be generally in the upper range of intelligence test scores.[1] Predictions from intelligence measures, however, have been plagued by problems of restriction of range of talent and by inadequacies in performance definitions and measures. In most instances the Medical College Admissions Test (MCAT) has been used as a general intelligence indicator.[2] The following slight to moderately predictive relationships have been consistently reported: MCAT scores correlate with National Board Exam scores; undergraduate grade point average correlates with first and second year medical school grade point averages.[3] Premedical grades and MCAT scores appear to be more predictive of grades in the first two years in medical school than of later achievement indices.[4] MCAT scores have been tested in relation to physician performance and found unrelated to supervisors' evaluations of medical practice or to tests of achievement in clinical medicine.[5]

In short, attempts at predicting "success" in medical school and medical practice from ability measures have been largely unproductive except in cases where the same characteristics are measured at a later point in time, using similar testing tools. When leaps are made from intelligence to academic achievement to behavior in

ill-defined work settings, there is little evidence of significant correlation between the measures.

The absence of significant correlation between different academic measures has led researchers to investigate the area of personality attributes of medical students. Much of the literature in this area is not comparable due to diversity in the testing devices used. A few common or similar traits that have been consistently found to characterize medical students will be mentioned.

Investigators using the Edward Personal Preference Test (EPPS) and the California Personality Inventory (CPI) have noted that their samples evidence high scores on endurance, achievement and independence.[6] Studies using the Allport-Vernon-Lindzey Scale of Values report that medical students are high in theoretical value preference.[7]

Vocational interests as measured by the Strong Vocational Interest Blank typically report that medical students have values "like those of physicians," which reiterates the high achievement-independence-endurance picture cited above.[8] These facts alone do not seem particularly enlightening given the advanced academic level of the sample. However, there appears to be some indication that medical student samples are, in some ways, distinctive from other high academically oriented students. Myers and Davis[9] compared over 4,000 medical students to 3,503 college bound high school students and found that the medical students contained a quarter again as many introverts, intuitives and feeling types as would be expected from the high school

frequencies. Solkoff (1967) found medical students more introverted and "sensitive to the needs of others" than law students.[10]

A few attributes measured by the tests cited have been reported to be significantly correlated with achievement and/or intelligence measures. High MCAT scorers tend to subscribe to aesthetic values, while low MCAT scorers have preference for economic values.[11] A significant positive relationship between introversion and academic success in medical students has also been noted.[12] These findings are congruent with Myers' findings relating to academic performance and values of several of her personality types.[13]

Some studies on medical student traits have reported findings that have not been duplicated elsewhere and occasionally have been contradicted.[14] This suggests several possibilities in addition to instrumentation or measurement problems. The sample is quite likely to vary from school to school as a function of differing institutional goals and admissions criteria. A major problem, however, in comparing samples used in the literature on "needs," interests and attitudes is the lack of unifying personality constructs underlying the different instruments used.

The search for the "best" students among the medical school applicants has generally been based on traditional ideas of what is considered important in medicine. It is now recognized that identification and development of "creative" medical students who can add original ideas, methods and solutions to the health services should be encouraged.[15] Literature on creativity in medical students suggests

that the usual admission criteria may not identify students with a great capacity for innovative thinking. It has been reported that creative and noncreative students evidence differences in interest and motivation. Studies of persons at high occupational levels indicate that very creative scientists, writers and mathematicians are also highly intuitive thinkers.[16]

The issue of personality change in medical school has been most clearly raised in the literature dealing with "humanitarianism" and "cynicism." It has been consistently reported that medical students become more "cynical" and less "humanitarian" as they progress through school.[17] Gray, et al., investigated the question of how these characteristics change after graduation. Their findings suggest that humanitarianism increases and cynicism decreases after several years in medical practice.[18] The suggestion has been made that the increasingly "cynical attitude" seen in medical school is functional for the adjustment tasks required of students.

Sociological studies of the passage through medical school have emphasized different aspects of these adjustment tasks.[19] Psychological studies have attempted to identify sources of stress for students. They consistently report that academic pressure ("making it," absorbing enough material, etc.) and a host of "initial experiences," such as clinical encounters, give rise to high levels of situational anxiety.[20] Boyle and Coombs conclude that a successful adjustment requires that students become more realistic about medical training than they are when they first enter medical school. This "realism" requires

deviation from the idealized system which imposes unreachable standards. They also found that factors relating to restriction on personal freedom were ranked as more distressing than real or anticipated stresses pertaining to patients.[21]

The personality patterns associated with "successful" management of stress in medical school are reported largely in tautological fashion: i.e., "well adjusted" personalities manage situational stress better than "mal-adjusted" ones. Evidence applicable to the question of whether or not there are consistent neurotic patterns among medical student populations is contradictory. The Minnesota Multiphasic Personality Inventory (MMPI) has been used extensively on medical students, but no overriding pattern has been reported.[22] Studies comparing medical students with "normal populations" have both expounded on their superior state of mental health and decried their neurotic character. It seems self-evident that severe personality pathology would interfere with management of stressful situations and with academic achievement. A high level of ability, however, has been reported to aid the adjustment of students with either "personality difficulty" or high anxiety.

Where a trait such as anxiety is viewed with other attributes of individuals, and in light of situational demands, it may be possible to make statements about the strategies of "adjustment" that may be expected of certain types of students. For example, the highly "creative" students (reported on by Graves, et al.) with negative motivational ratings may be most likely to experience stress due to lack of personal freedom.

A framework that attempts to provide reliable information about the kinds of choices humans make for their lives and work and their consequent behavior has a dual task. It must be broadly conceived, allow for inclusion of as many identifiable organizational and "process" influences as possible, and yet permit a detailed analysis of individual matters such as "habits of mind." We have assumed that different kinds of students will experience the medical school environment in different ways, paying attention to different things, perceiving the same events in different ways and, consequently, making various kinds of career commitments.

The problem, then, is to identify who is affected by what kinds of experience to become what kind of physician. The development of a personality typology of medical students and prediction of medically relevant phenomena from this typology represent our initial attack on this problem.

CHAPTER 2

CONCEPTUAL ORIENTATION: MAN AS PROBLEM SOLVER

As Hall and Lindzey[1] have pointed out, the way the term "personality" is defined is basically a function of the conceptual framework of the individual doing the defining. Thus, the purpose of this section is to provide a sketch of the orientation toward human behavior and experience which is employed in the present research.

The approach that is taken here would probably be classified as a "cognitive" or "information processing" schema. As such, it is concerned with the ways in which knowledge is assimilated, organized and used, with processes of perceiving, conceiving, attending, problem solving and so on. From this point of view, ". . . the essence of the organism's interaction with the world is the identification and acquisition of potentially useful stimuli, the translation and transformation of the information received into meaningful patterns and the use of these patterns in choosing an optimal response."[2]

In the discussion which follows, the ways in which a person interacts with his environment are considered in terms of "problem solving." While this term is often associated with "cold" intellectual activity rather than such things as interpersonal relations, identity, attitudes, ideology and emotion, it is believed that the concept can be usefully extended to the latter as well. In doing

so, phenomena which are often described in terms of everyday language must be "translated" into the concepts of problem solving and one is forced to re-examine often implicitly held assumptions or "theories" about the nature of human nature.

Problems

What is a problem? Reitman[3] offers the following general definition: "A system has a problem when it has or has been given a description of something but does not yet have anything that satisfies the description. That is, when it is required that an element be found, obtained or created that satisfies a description (characterization, etc.) of what we desire (a goal), then we generate a problem." For example, a person is presented with a problem when he is asked, "What is the distance in feet across the Rio Grande at the Central Avenue crossing?" In this case, the question itself constitutes a description of the goal and the element which satisfies the description is a particular measurement in specified units at a specified place. In the problem, "What is black and white and red/read all over?" only a few attributes of the goal are specified and, when heard aurally, there is ambiguity with respect to the referent of one of the attributes. This creates a sub-problem, namely to decide what interpretation to place on "red" or "read." When a husband asks of his wife, "What do you want from me?" the problem he is presenting to her is one of specifying the characteristics of a goal state she has in mind. If he chooses to accept for himself the characterization provided, he can then engage in activity to create elements (for

example, in his behavior) which satisfy the description. When a medical student decides he wants to do "well" on National Board exams, he is specifying in his description of the goal a particular range of values on a set of attributes which will be accepted as criteria for having attained it. Some less prosaic examples of human problems will be considered below:

Well-defined and Ill-defined Problems

Problems are called "well-defined" when both the initial conditions and goals are fixed and the problem solver must confine himself to a well-specified set of operations. The Rio Grande problem referred to above, for example, was a relatively well-defined problem: a specific set of measurement operations in specific units of measurement was required at a specific place. Actually, the problem is well-defined only in comparison with more vaguely defined problems. One could ask for greater precision in the specification of near and far points at the Central Avenue crossing. The precision of the problem solution is not specified -- should it be in whole numbers, carried out to two decimal places or three, etc.? Should the measurement take place when the river is high or low or at some point in between? Can measurement be by triangulation or should some meter be used? There is, thus, a continuum of rigor in defining problems.

What makes a problem ill-defined are so-called "open constraints." One type of open constraint is when the values which attributes may assume are left unspecified in the problem description, e.g., when a person is asked to write a report but is not told what it should be about, how long it should be or what stylistic characteristics it

should possess. Another type of open constraint exists when there is a large amount of variability concerning the referents of attributes. Characterization of initial conditions in such terms as "misery," "inefficient," "crazy," and goals in such terms as "the good life," "love," "security," "respect," result in much disagreement about what, exactly, is meant. A third type of open constraint exists when there is ambiguity about what operations are permissible in problem solving. Is cheating an acceptable operation to achieve good grades? Are self-deceptions permissible operations in solving problems of low self-esteem? Is it acceptable, according to the rules of the game, to hide one's intentions or purposes in interpersonal relations? Finally, open constraints exist when the criteria for deciding when a problem solution is attained are not specified. The ulcerated businessman, striving for a goal which he characterizes as "financial security," may decide, after amassing his first million, that it is not sufficient. (Actually, his dissatisfaction may be due to an inadequate characterization of the problem and, consequently, an irrelevant set of operations.)

In order to solve ill-defined problems it is necessary to close all, or nearly all, open constraints. This may be achieved by a weighing of values ("Cheating is worse than bad grades"); by a calculation of side effects of alternative operations (self-deception may lead to a later "rude awakening," embarrassment, disillusionment, etc.); by subscribing to convention (as in much of science, or in adhering

to cultural definitions and prescriptions); and by assumption: ("That's the way he is," or "I can't do that," or "That's what it's all about"); or in using operational definitions in science. This is not to say that all open constraints must be closed prior to initiating problem solving. In fact, sometimes the freedom allowed by the openness of certain constraints makes solution possible where, otherwise, it would be impossible.

Because open constraints can be closed in a variety of ways in many situations, one can expect individual as well as intra-individual differences in problem solutions: "There is more than one way to skin a cat." Furthermore, any given solution to an ill-defined problem will not meet with universal acceptance, e.g., how one should raise children.

Problem Solving

Problem solving involves the transformation of an initial state (a description of the way things are now into a terminal state (a description of what is desired) by means of certain sets of operations (strategies). For example, if one is asked to "make a silk purse out of a sow's ear," one has a problem with initial state (sow's ear) and terminal state (silk purse) specified. To solve the problem, all one has to do is reduce the difference between these two states. Since this problem is not solvable if taken literally, one is faced with a sub-problem: how to "take" the statement of the task. If this sub-problem is solved by

assuming the statement is meant figuratively, one is then faced with a problem of finding a pair of elements which, in some respects, are analogous to "sow's ear" and "silk purse." This is a problem in which some of the attributes of initial and terminal states are left open or unspecified, e.g., the purse might not really have to be silk, as long as it "looks like silk."

What must a system be able to do in order to solve a problem? First of all, it must have some way of characterizing or representing the problem in a "space" where problem solving activities take place. That is, it must be able to encode ". . . defining goals, rules and other aspects of the situation -- in some kind of space that represents the initial situation presented to (it), the desired goal situation, various intermediate states, imagined or experienced, as well as any concepts (it) used to describe these situations to (itself)."[4] Jerome Frank[5] states this requirement in a less complicated fashion: "In order to be able to function at all, everyone must impose an order and regularity on the welter of experiences impinging upon him. To do this, he develops out of his personal experiences a set of more or less implicit assumptions about the nature of the world in which he lives, which enables him to predict the behavior of others and the outcome of his own actions."

If the Rio Grande problem, for example, is assumed to be an instance of the "triangulation problem type," it might be represented in an external memory system (on paper) in terms of geometric relations between three points. Point A could represent the near side of the river, point B, the far side of the river, and point C, some known distance from A. Problem solving operations could then take place within this space.

A second requirement of the problem solving system is that it have methods for reducing differences between desired and initial states. In the computer analogy, programs of information processing serve this function. One type of program, the algorithm, will definitely provide a solution to a certain set of problems (when the availability of resources such as time is not of concern). The class of problems for which it is applicable must be explicitly specifiable and no constraints must remain open in problem definition, program and criteria of solution. This is the kind of program demanded in one of the Stanford-Binet Intelligence Scale tasks: the subject is given the problem of having lost something on a baseball field and is supposed to demonstrate a systematic search routine in finding it, i.e., his plan is supposed to cover all possible locations in the field.

Another method, the heuristic program, does not guarantee problem solution. It is composed of a group of tactics, rules of thumb, etc., which are applied to the problem in order to "make progress" in a particular direction. The problem of finding the lost object in the field might be attacked by first identifying locations which had been occupied by the subject, then developing a priority list of locations, and finally checking these locations in an order governed by their priorities. If the object was not found in any one of these areas, a new priority list might be developed and these locations searched. Although the object may not be found at all (since all locations are not inspected), it might be found more

quickly than by systematic search (if it lies in one of the priority locations). The work of Newell, Shaw and Simon[6] has demonstrated that a set of heuristic methods, organized into a problem solving program, is able to achieve proofs of theorems in symbolic logic. Furthermore, the operation of the program shows characteristics similar to that in human problem solving, e.g., preparatory and directional set, insight (sudden grasp of the structure of a problem), concept formation and hierarchical processing (breaking a problem down into sub-problems).

It has been suggested that many (if not most) of the problems human beings solve, or try to solve, are ill-defined and that their methods of attack are heuristic as opposed to algorithmic. In addition, one writer[7] has suggested that human problem solving strategies are ill-defined as well, i.e., that the "elements" of the strategies are inoperable by themselves and require information which "may be stored diffusely throughout the system, distributed over its varied experiences, ideas, concepts and intuitions, so that 'the procedure for solving this particular problem' is effectively coextensive with the total experience of the system."[8] Reitman has postulated that the trick is in the way humans store and retrieve experience, i.e., as general rules (open information structures) which can be interpreted (transformed, abstracted) to fit current conditions. "Just as a good cook knows how to modify general instructions to take account of local variations in humidity and in the quality and consistency of his ingredients, so the skilled

problem solver stores and interprets his knowledge and strategies as open information structures, an arrangement that presumes a high level of flexibility and intelligence at the time at which they are utilized."[9] A parallel exists in Koestler's[10] distinction between rules and strategies: rules determine a system's structural or functional pattern while strategies determine which of a set of possible alternatives is actually selected as a function of environmental contingencies. Woodworth's[11] "schema plus correction" was an earlier version of this same idea.

A third requirement of the problem solving system is that it must be able to detect and evaluate success or failure of its strategies. This is necessary in order to know when to stop applying them (when the problem has been successfully solved) or when to modify them (if goals are not being attained).

Interpersonal Problem Solving

Any time a person interacts with another (or others) he may be viewed as engaging in "interpersonal problem solving." Although nearly all interpersonal problems are basically ill-defined, consensus on what is expected of the participants may be so high as to virtually close all open constraints by convention and reduce the problem to a well-defined one, as in interactions between customer and cashier at a restaurant. Each participant identifies it as a problem (relationship) of a certain type and pulls out of memory the routine solution for such problems. On the other hand, where there is a lack of consensus

about the nature of the relationship (e.g., the goals to be attained in it) or where one member wishes to meet new goals in an established relationship, improvization in problem solving may be called for. The initial state in such a situation may be conceived in terms of a person's current perceived role enactments (the way he sees himself or the other person acting) and the terminal state may be conceived in terms of the kinds of role reciprocities that are desired or expected. The problem is to reduce the difference between these two states by means of behavioral strategies.

A convenient illustration of this way of thinking about interpersonal behavior is provided in an interchange between a fourteen year old girl, who had been the subject of gossip among her peers, and a slightly younger boy who had a "crush" on the girl:

Boy: "You should have heard what Jim, Bill and Lester were saying about you down at Harry's (a local restaurant)."

Girl: (pleading): "Please tell me! What did they say?"

Boy: "I promised not to tell. They'd <u>kill</u> me if I told you!"

Girl: "Tell me, please! Please! I promise not to tell a soul."

Boy: "It's getting late. Maybe if I come over tomorrow I'll tell you."

Girl: "Well, O.K. But come over as soon as you can."

In this example, the initial state, or type of role relationship, which existed between the boy and girl had attributes of "distance," "status difference," and so on, somewhat like the relationship between a sister and kid brother. The boy's expectations were no longer of this type, however. His desired terminal state involved establishing

a boyfriend-girlfriend kind of reciprocity with attributes of "closeness," "affection," "status equality," etc. One may consider the boy's behavior in this sequence as sub-problem solving on the way to the eventual terminal state he desired, the sub-goals being elicitation of attention and interest from the girl. Assuming these were actually his objectives, one may infer probable constraints on the strategies he chose. Risk of rejection, for example, was avoided by disguising his intentions -- he displayed no unambiguous behavior which would have indicated what he wanted from the girl. The risk of having his strategy exposed to his friends and to the girl was minimized by trying to insure that she would not reveal the transaction -- she wouldn't want to be responsible for his death. And the probability of a continuation of the relationship was increased by implying there was more to the story than what he had so far revealed.

The problem solving space in interpersonal problems seems to require representation of several kinds of elements: 1) the imposition of some scheme for determining interaction dimensions, i.e., the problem solver has to decide what goals might reasonably be expected to be achieved or are "appropriate" in a given encounter[12] (e.g., should he set up as a goal the attainment of evidence of his superior status, the attainment of money, the attainment of sexual gratification or the attainment of nurturance?); 2) characterization of the other person(s) in the situation[13] (in terms of intentions, abilities, style or whatever else may be relevant to the task); 3) characterization

of the problem solver himself in the relationship situation (his role, his status, his personal identity, his needs, etc.); 4) definition of constraints in problem solving activities in the situation (identification of rules, e.g., "All's fair in love and war" (no constraints), or "The proper way to behave with the Queen is . . ." (many constraints).

Just how a person goes about representing these elements in his "space" is not clear. Abstraction, the filtering out of details of the task environment unneeded for some purpose, undoubtedly plays a role. This is necessary in order to be able to apply "old" techniques, to get the situation to fit a "problem type." Role concepts comprise one such method of abstraction. Thus, by identifying a relationship as a "friendship" type one may pull out of memory the "list" of goals which might be met in such a relationship, compare them to one's current "needs" and generate a goal (e.g., "support") for the encounter. Within the constraints imposed by the relationship setting, one might try an old routine (e.g., telling a tale of woe) for attaining the goal.

The distinction between rules and strategies in interpersonal problem solving can be illustrated by "guilt induction" techniques. The general rule which the problem solver follows is to produce an element which implies that the other person in the situation has broken (or will break if he engages in some bit of behavior) some moral principle and that this is (or will be) a source of pain to the problem solver. However, the "situation" determines which moral

principle is implied, what action is implicated, and what the nature of the "pain" is presumed to be. When a mother says to her son, "Well, go ahead and join the Navy then if it means so much to you. I just thought you would like being a doctor. We had planned on it for so long . . .," she is implying that if he joins the Navy he will be breaking some moral obligation to her and that this will cause her to be disappointed. In another situation, she might invoke the guilt induction rule but in a strategically (or tactically) different form: "Have a good time, dear, I'll just stay home alone and mend your socks." In this case, "going out" is the behavior which causes mother to feel lonely (a state) during which she will presumably suffer in silence but, even so, will continue to take care of her son's needs!).

The "psychoanalytic technique"[14] is another interpersonal problem solving rule with infinite variations. The general form is "If you do X it really means you are Z." Situational considerations (and the goals of the problem solver) serve to specify X and the way it is reinterpreted to mean Z. "If you go to your mother's house again this week it means you have an Oedipal complex." "You want me to be understanding and sympathetic only because you're fixated at an oral stage of development." "You are messy because you're an anal character."

Not all interpersonal programs have the malevolent qualities possessed by the above examples, of course. The skilled interviewer, for example, follows a rule of asking generally phrased questions in

order to get a subject to tell his own story without many externally imposed constraints. Lovers may agree to follow an "honesty rule" in order to promote depth in their relationship. Some psychotherapists follow the rule of balancing "support" with "threat" so that patients do not leave treatment prematurely. All of these rules are non-operational in any given situation without generating and solving sub-problems on the basis of the immediate situation and the total mass of information stored by the problem solver.

Recurrent Sub-problems of Human Existence

In his normal day-to-day activities, the individual must solve numerous problems. Fortunately, he does not have to "start from scratch" in each problem situation. In the course of development, just as he has learned a set of rules for generating grammatical sentences, he has acquired methods ("routines") for representing elements in a problem space, for assigning problems to problem types, for filling in the open constraints in ill-defined problems, and for solving at least some of the sub-problems generated by ill-defined strategies. Although these routines must be selected and placed in some kind of order for any particular problem, the problem solver need not work through the details of each routine or sub-routine. Thus, when presented with the problem of driving from one location in a city to another, the problem solver does not have to worry about how to p' ce the car in motion, how to navigate through traffic, etc. These routines will "take care of themselves," so that the problem solver may concentrate

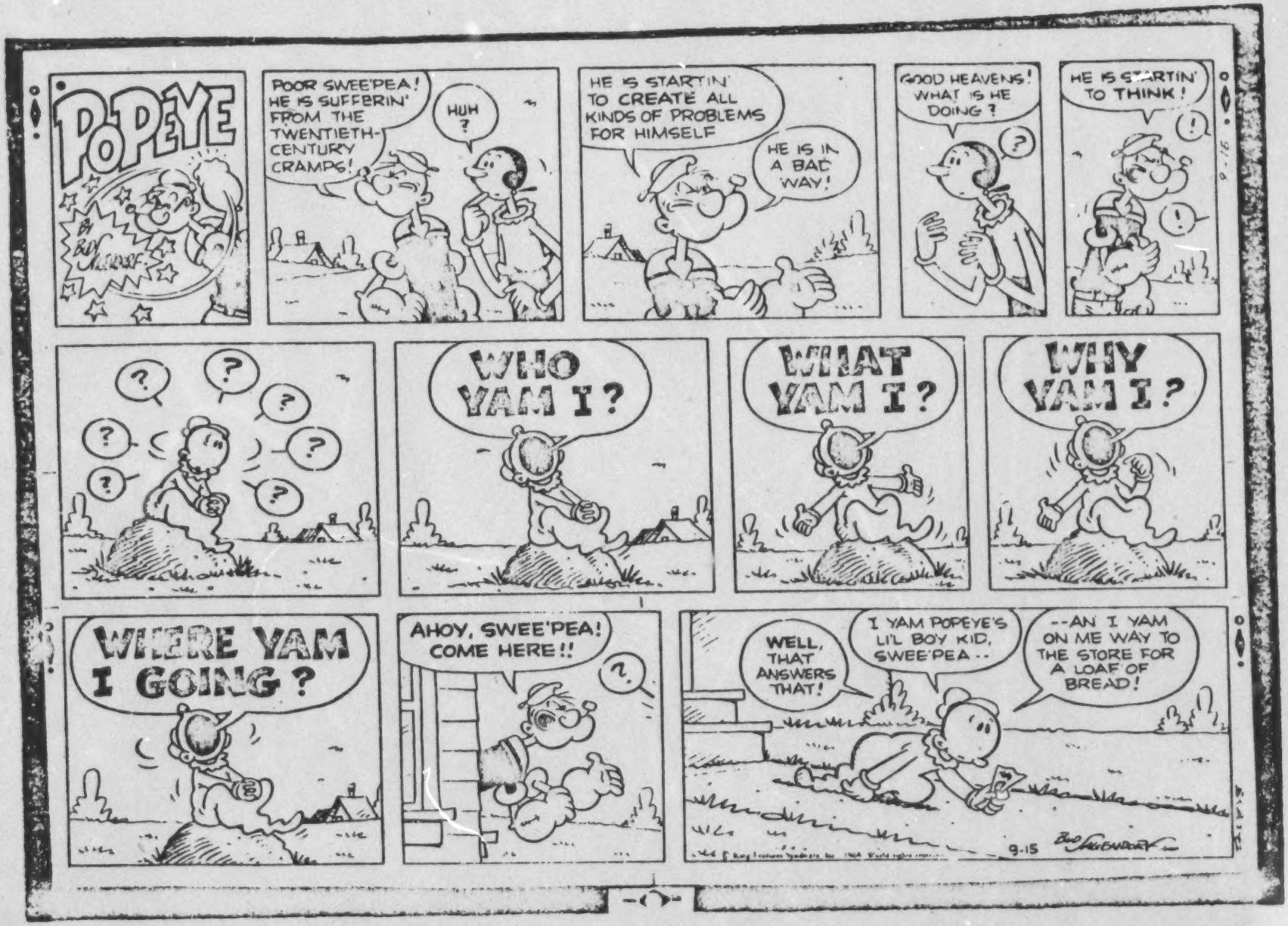
on directions, distances and landmarks. Similarly, a husband interacting with his wife over breakfast need not go through a process of defining his identity in this situation. It is a "routine" matter and the definition he used yesterday will suffice for today.

But, perhaps throughout his lifetime, man is confronted with problem solving tasks for which routine problem or sub-problem definitions are not completely adequate. These are situations which occur when new goals are set for the individual: when he sets new goals for himself or after he has achieved previously set goals; when someone embedded in his life pattern dies or changes radically; when he himself changes physically or psychologically; when the norms of socially acceptable strategies change from those he is used to, etc. The child whose parents decide it is time for him to assume some responsibility for household chores can no longer operate effectively with concepts of himself as "receiver" and his parents as "providers." The teenager who wants to be more self-directing must define his directions, the resources with which he has to work, and a set of new relationships with his parents. The man who finds himself to be a "premature success" according to the criteria he had defined for himself must seek a new set of goals or redefine his criteria. The person whose spouse dies must reassess his assumptions about his life space, his long-term goals, his needs and his relationships with members of the opposite sex. The husband whose wife changes from meek and mild to angry and demanding because she is "taken for granted" (treated routinely) must modify his conception of her in order to

effectively problem-solve in that relationship. The aging individual must redefine his physical and mental capacities as they are represented in his problem solving space or he will fail to achieve his goals. The person who, for whatever reason, finds that his assumption about his being "unloveable" was false or imprecise is in a position to reconstruct all his information processing procedures that were based on that assumption. The person who closes open constraints in ill-defined interpersonal problems according to the cultural patterns of an earlier era may earn criticism rather than the respect for which he had aimed.

All of these changes in the task environment require some corresponding change in the representation of elements in the problem solving space or the individual will suffer a loss in his problem solving effectiveness. Since it is assumed that the individual calls upon recursive ill-defined strategies in attacking ill-defined problems, this means that he must modify his programs (or sub-routines) for filling in open constraints in some way. He must change the way he thinks about himself, about others with whom he interacts, about what are "allowable" strategies, and about the way he defines his goals.

The cartoon by Bud Sagendorf (Figure 1) points out (in ill-defined terms) the general nature of recurrent sub-problems in personal identity. The questions which Sweetpea poses are generic ones, subject to different interpretations at different life stages, in different circumstances and for different individuals. And the answers are only tentative and pragmatic -- they allow the individual to go about current problem


POPEYE
POOR SWEE'PEA! HE IS SUFFERIN' FROM THE TWENTIETH-CENTURY CRAMPS!
HUH ?
HE IS STARTIN' TO CREATE ALL KINDS OF PROBLEMS FOR HIMSELF
HE IS IN A BAD WAY!
GOOD HEAVENS! WHAT IS HE DOING ?
HE IS STARTIN' TO THINK!
WHO YAM I?
WHAT YAM I?
WHY YAM I?
WHERE YAM I GOING?
AHOY, SWEE'PEA! COME HERE!!
WELL, THAT ANSWERS THAT!
I YAM POPEYE'S LI'L BOY KID, SWEE'PEA--
--AN I YAM ON ME WAY TO THE STORE FOR A LOAF OF BREAD!
9-15

solving but can be brought into question by the changing demands of the task environment. Sweetpea's acceptance of the identity imputed to him by Popeye may be functional at his stage of development, but, in the normal course of existence, dysfunctional (e.g., when he sets the goal for himself of "becoming his own man" or when Popeye, or a wife, desire him to be more "independent").

How do individuals go about modifying their routines and sub-routines? Kelly[15] has suggested that, in the realm of interpersonal relations at least, the human problem solver generates hypotheses and tests them, essentially like the behavior of the scientist (although perhaps less systematic and controlled). That is, he uses his behavior to pose questions (sub-problems) about himself, others, states of the world, etc. However, his "questions" may be cast in the form of tentative conclusions (hypotheses) which can (it is assumed by the problem solver) be confirmed or disconfirmed by the evidence generated by acting as if the hypothesis were true. The adolescent girl, who is troubled by doubts of her "loveability," may hypothesize that she is "unloveable" and "test" the hypothesis by making a suicide attempt, threat or gesture. The hypothesis would presumably be confirmed if the results of her act were censure, rejection and lack of concern by certain individuals. Sympathy, affection and support would, one would suppose, disconfirm the hypothesis and allow the individual to entertain the alternate hypothesis that she is "loveable." Although the latter may occur in some cases, it frequently does not. The problem solver may have doubts

about the adequacy of her experiment: she may interpret the response of others as being temporary and expedient, not revealing their "true" attitudes; or she may disqualify the feedback on the grounds that it was role behavior (e.g., on the part of mental health personnel) and not an indication of personal feelings. In addition, the problem solver using this kind of strategy frequently with the same individuals may fulfill her own prophecy; others would doubt her credibility and tend to provide negative feedback. Thus, the individual who tests these kinds of hypotheses may stack the cards towards maintenance of the initial hypothesis.

An example of hypothesis testing in the area of occupational identity is provided by a medical student who, during his third year clinical rotations, was entertaining the hypothesis that he could be a surgeon. Confirmatory evidence was provided by his fascination with surgical problems and procedures. However, he found that his nervousness revealed itself in poor motor coordination when he was wielding a scalpel. The hypothesis "I can be a surgeon" was subsequently abandoned and a different specialty identity hypothesis entertained.

Hypotheses do not appear "out of the blue," of course. Constraints on the hypotheses which an individual can possibly entertain are imposed by characteristics of the current problem solving system and the task environment. For example, an individual who has, in the past, frequently represented himself with negatively valued attributes is likely to form hypotheses cast in the nature of negative identity

statements. And the individual embedded in a matrix of relationships in which significant others define him as "crazy" would be hard put not to entertain such a hypothesis about himself. The variability in personal histories and the equivocality of evidence produced by individual hypothesis testing results in a diversity of hypotheses in the personal-social realm.

Besides being diverse, hypotheses can be phrased in terms of different "levels" of generality. For example, one can hypothesize that he is inadequate as a surgeon, inadequate as a physician or inadequate as a human being. The implications of confirmatory evidence for modification of the person's self structures obviously depends on formulation of the hypothesis. In one case only minor changes in the way one represents himself to himself might be required while in another case wide ranging effects might be expected. According to Newell and Simon,[16] ". . . ongoing changes in the cognitive system must be capable of being assimilated by the system that is already there, at the same time that the latter remains in reasonable working order." Thus, one might expect gross changes, in identity for example, to be quite rare, accompanied by confusion and vast disruptions in normal (for the individual) problem solving procedures, and dependent on a combination of a particular kind of problem solving system and a particular kind or amount of "evidence." Conversion experiences, such as occurred with one medical student who quit school to become a preacher in a religious sect, appear to have this kind of character to them. The more usual circumstance appears to be incorporation of

of changes at a lower level of generality -- at a sub-routine level. Thus, a medical student might change his operational definition of "helpfulness" to one involving doing less for patients and not going out of his way, while retaining the concept of himself as being "helpful." His behavior has changed, but the way he thinks of himself (in trait terms) has not.[17]

Similarities and Differences in Problem solvers

In the conceptual framework presented above no mention has been made of particular contents of problem solving systems (except by way of illustration). It has been assumed that the individual has mechanisms for abstracting elements from a task environment and representing them in a problem solving space; that he has strategies for reducing differences between initial and terminal states; and that, in problems involving social interaction at least, he must represent himself and the other(s) in some way. But just what the contents of his representations and strategies are and how they might be measured are not specified. An individual must have an identity (self-concept) in order to attack certain kinds of problems, for example, but the conceptual scheme, as it now stands, says nothing about the attributes or dimensions of this representation. It is possible to conceive of a state of affairs, then, in which each problem solving system is unique, i.e., where the structural or organizational differences are so great as to preclude comparisons.[18]

However, there are factors which place limits on the kinds of human information processing systems that may develop and which lead

to some degree of structural similarity. The first of these is, of course, the nature of the biological systems comprising man. While there are individual differences even here (e.g., in short-term memory capacity), the basic structure and functioning of these systems is highly similar across individuals. The limits within which it is possible for these structures to operate make certain kinds of information processing procedures possible and exclude others.

The other major factor (or set of factors) which makes for similarity of problem solving structures is common experience. One type of common experience is that produced by exposure to a common array of problem element representations (e.g., concepts) and problem solving strategies, i.e., to a common culture (or sub-culture in the case where there is differential exposure to the members of the array). This includes the "common sense" knowledge of a society, the main characteristic of which, according to R. S. Peters,[19] is its ". . . intimate connection with the practical concerns of a society, the particular rules and purposes of its institutions, and the more personal relationships of its members." From this point of view, the array of emotion, motivation and trait terms available to members of a culture constitute conceptual "templates" for dealing with interpersonal problems.

Another type of common experience, not entirely separate from the first, is provided by exposure to similar task environments. That is, "If we put several humans in the same problem situation, if they have the same goals, and if they have sufficient ability to solve

the problem, then many features of their behavior are given the same shape by the task environment. As we have seen, the shape imposed by the task is effective even if the humans are not quite able to solve the problem, for the same task features appear obvious to all of them and are responded to similarly."[20] Similarity in the appearance of task features, it should be noted, is dependent upon similarity in the information processing systems of the problem solvers. While the authors quoted were referring to a set of relatively simple tasks, it is believed that the principle holds true when developmental and interpersonal tasks are considered, e.g., "rebellious" adolescents may construe the problem with their parents in quite similar ways.

Insofar as problem solvers differ in the operating characteristics of their basic biological systems, in their experience (including the timing and ordering of experience), or in combinations of these elements, one can expect to find individual differences in problem solving behavior. The more ill-defined the problem, the more likely that these differences will make a difference. That is, when it is possible to fill in the open constraints (in goal statements, referents of attributes, permissible operations, criteria of solution, etc.) in many ways, there is the possibility for variability between individuals. Social, interpersonal and life style problems provide such ill-definedness, of course.

A <u>vector</u> of individual differences in problem solving systems may be defined as any measurable characteristic of problem solving

performance in a given task that differentiates members of a set of subjects. Since the performance itself requires functioning of a total system, however, the between subject variation in what is measured probably will not reflect individual differences in just one component of their systems. For example, if the task is to repeat a series of numbers in the order given, individual differences in the number of digits repeated may arise from differences in short-term memory capacity or from differences in the amount of "anxiety" experienced by subjects (which, in turn, may be a function of the ways in which subjects represent themselves in relation to the test administrator or to an imaginary "judge" of their performance). The measure might also reflect some characteristic of the system as a whole, e.g., the integration of its parts. The concept of "g" (general intelligence) is an example in the realm of intellectual abilities, while introversion-extraversion may be a parallel in the personality realm.

Two general approaches have been taken to the problem of a measure reflecting multiple influences. The first of these involves constructing tasks so as to minimize the contribution of certain processes assumed to be taking place, while maximizing the contribution of others to the between subject variations. Thus, if one reduces the demands made on the perceptual-discriminative processes by simplifying the sensory display, on the motor or execution processes by selecting well-learned and simple response alternatives, and on short-term memory by dealing with 7 ± 2 "elements," then the contribution of "central" processes to inter-subject variation may be increased. With this approach the identification of

organizational or "total system" influences is difficult if not impossible.

The alternative approach involves giving each subject a number of tasks which are assumed to have something in common or to require similar kinds of information processing operations. Then, by an analysis of covariations between different measures, common sources of variation may be "extracted." Hybrid measures may then be constructed which reflect the relative contributions of the "common source" to each task measure. However, this procedure still does not insure that one has a measure of some discrete problem solving component, since factors may emerge for other reasons.[21]

From the vantage point of the present conceptual framework, vectors of individual differences in problem solving systems may take many forms. They may fall into areas traditionally designated by the term "personality" or into areas traditionally the province of "intelligence" and "abilities." They may deal with specific contents of problem solving systems (e.g., the contents of self representations or the content of "common sense" knowledge) or with characteristics of of system or sub-system operation (e.g., "category width," "sharpening vs. leveling," "g," "intuition").

Medical Students as Problem Solvers

It is within this general framework of problem solving that the medical student is viewed. The problems to which he must address himself range from relatively well-defined to relatively ill-defined; from those

which must be tackled immediately to those which can be worked on for several years; from those with relatively circumscribed strategic implications to those having broad and far-ranging implications; from those for which previously acquired routines apply to those requiring largely new methods of information processing. He must face the survival tasks of being a student: passing tests and earning acceptable evaluations. This may involve sub-problems of skill and knowledge acquisition and, in some cases, the sub-problem of impression-management with faculty. He must deal with the problems of relating to other people in the world of medicine: patients, colleagues, nurses, administrators, etc. For these kinds of problems he may have to solve the sub-problems of how to "represent" these others in his problem solving space. And he may have to expand or modify his own self concept. In the long-range, the medical student needs to solve the problems of specialty choice, work setting selection, and practice style. These problems also require identity knowledge: what one likes, dislikes, is good at, is poor at, what one's priorities are, etc. -- and the constraints may still be "open" in the individuals representation of himself, i.e., in his prior problem solving he may not have had to "know himself" along the dimensions needed for solution of the present problems. The sub-problems of representing alternative specialties, work settings, practice styles and their attributes must also be solved in order to match self and "niche."

The medical school environment, besides being a multi-task environment for the student, is a source of information, a pool of potential

problem element representations and prototypic problem solutions. That is, the faculty and staff of a medical school present to the student a diverse array of learning experiences, concepts, role models, values, attitudes, etc. This diversity in itself may constitute a problem for the student, namely, choosing which, if any, of the images presented he should incorporate into his own problem solving system. For example, representatives of some specialties may exhort the future physician to understand the mental life of patients while representatives of other specialties may disregard such phenomena altogether. Who is the student to believe? How can such discrepant approaches to patients be reconciled? Obviously there are several possible ways of going about this sorting and evaluating task. The student could proceed empirically, for example, by tentatively assuming some role and checking to see how it "fits" him and/or the situation. He could simply disqualify information from certain sources (e.g., those with low status in the medical community). He could develop a set of criteria for filtering out information that is not relevant to what he construes as his future role as a physician. He could use the expressed judgments of his peers as guides to whether or not certain information should be incorporated.

It seems likely that what the medical student strives to build into his own problem solving system and the way he builds it in will be governed, not only by that portion of medical life presented to him by his environment or by minimal requirements for graduation, but also by the general nature of the problem solving system with which

he begins. That is, the person's problem solving system, to some degree, directs its own development. Thus, for example, the person who prefers to deal with problems in a planned and orderly manner might be "turned off" by content areas thinly populated with such systematists and may identify with a faculty member who seems to approach problems in his preferred fashion. The foci of the present study are the contributions of (what are assumed to be) pre-existing problem solving systems to the further elaboration and specification of those systems within the context of medicine. Specifically, various types of problem solving systems, identified on the basis of personality characteristics, are used to predict medicine-related values, career dispositions, expectations and perceptions of student-faculty interaction and certain kinds of medical school performance.

CHAPTER 3

METHODOLOGICAL ORIENTATION: THE TYPOLOGICAL APPROACH

In the taxonomic schemes of the natural sciences the properties of an entity are seen as being due to the type of entity it is (e.g., its species membership): because this entity is a bird rather than a cat, you may expect it to fly rather than meow. Explanation is in terms of type or category rather than in terms of variations in degrees of attributes or linear combinations of attributes (as in multiple linear regression). That is, it is not assumed that a given range of values on some attribute means or implies the same thing irrespective of the ranges of values of other attributes with which it is combined. A body temperature near zero degrees centigrade, for example, means something different in a hibernating bear than it does in a man (or even in the same bear when he isn't hibernating). Similarly, a moderate level of anxiety has different performance implications in the context of "easy" as opposed to "hard" tasks and in introverts as opposed to extroverts. In these examples the entities (bears vs. men, hard vs. easy tasks, introverts vs. extroverts) must be considered qualitatively different systems even though they may share certain measurable attribute dimensions (body temperature, anxiety level).

In the present study, the taxonomic method is used to identify different types of problem solving systems in medical students and investigate their differential behavior in the medical school setting. It is assumed that different types of problem solving

systems exist in the medical student population and can be identified on the basis of what are considered "personality" indices; that these different types react to the medical school experience in different ways; and that the result is different career pathways and professional outcomes.

Types of Types

Use of the term "type" in everyday speech is often loose and indiscriminate even though it is basically a statistical concept. English and English[1] refer to such usage as "statistical concepts without statistics" meaning that "types" are postulated without the necessary factual basis. An example of such usage is where a single individual is made the basis for a type, e.g., a "Lincoln Type." This is more properly an archetype or prototype concept: an original model which embodies a set of characteristics to the greatest extent. While of some value in theorizing and communicating to audiences familiar with the archetype, it is limited in its empirical usefulness -- only one person fits the type.

When opposite extremes on a normal distribution of some characteristic are taken as "types;" one is dealing with what are referred to as polar types. This usage assumes that the extremes are discontinuous with those cases in an intermediate range, e.g., that introverts and extraverts constitute different kinds of entities from those individuals falling in between. Critics of this usage of type refer to it as the "type fallacy," arguing that establishment of "cutting points" in a continuous normal distribution is an arbitrary affair.

The modal type is defined by high modal frequencies of occurrence at certain points in a distribution or set of distributions. An example of a bimodal distribution might be the frequency of occurrence of different heights for a combined population of Pygmies and Watusies.

Of most relevance to the present paper is the species type or multidimensional modal type. Cattell[2] defines it as "the central profile tendency found in a defined subgroup of a population, which is measurable on certain dimensions. The subgroup is not arbitrarily defined but recognized by its constituting an unusual modal frequency of occurrence and segregation in the general population on a dimension or combination of dimensions." More simply, Lorr[3] defines this kind of type as "... a group of persons who are distinguished by a common set of characteristics that set members apart from others. A type is a multivariate concept; all members are characterized by a specific range of scores on the various dimensions of individual variation employed to describe them." In multidimensional distributions, it is possible for modes to occur in an overall pattern even when they do not occur in each of the constituent dimensions. This is shown diagrammatically in Figure 2.

Another distinction, based on the methods used in forming types, is that between special purpose or criterion -- referenced types and general purpose or "natural" types. In the former, entities are grouped together simply because they possess values

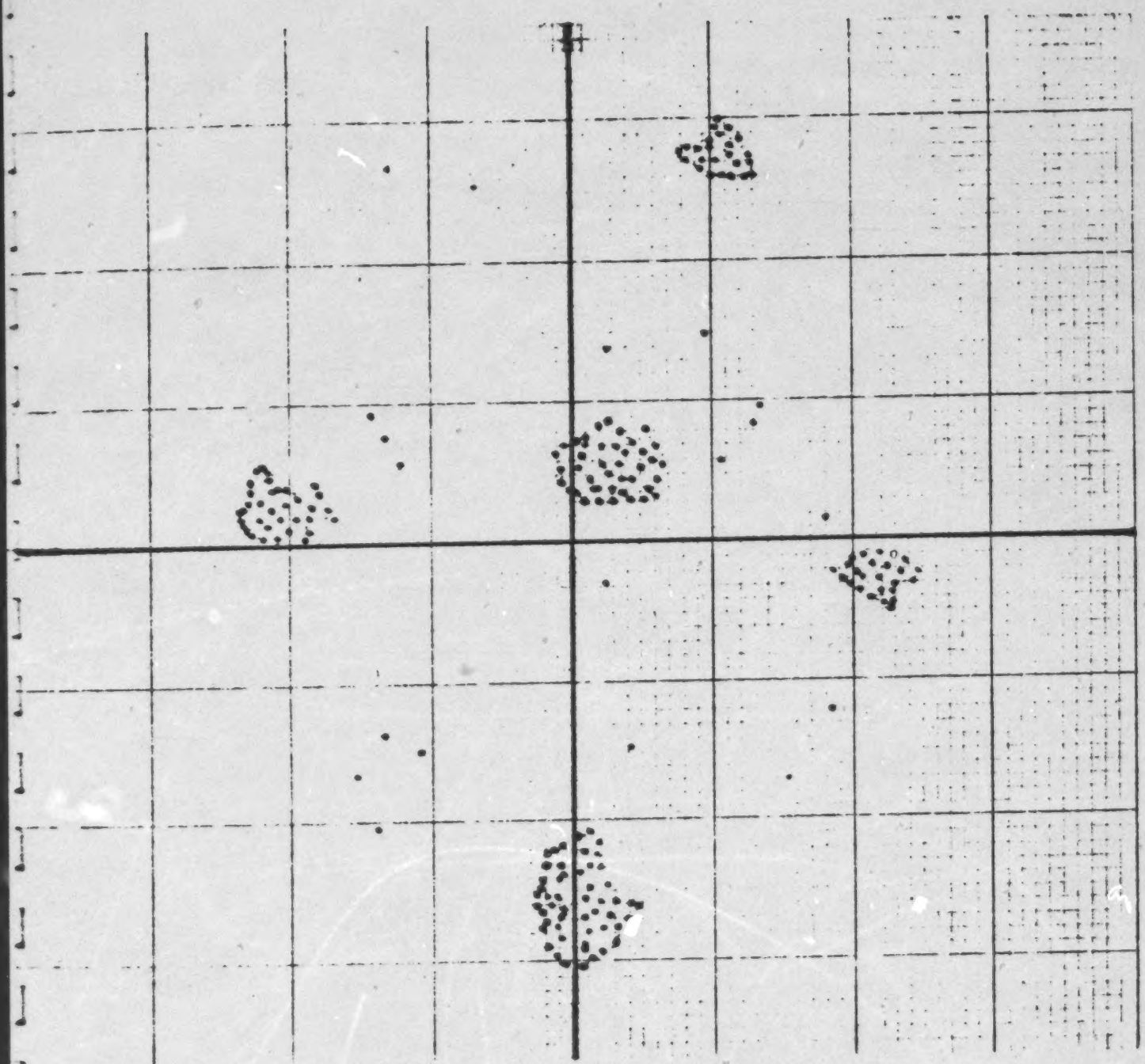


FIGURE 2

TYPES IN A TWO DIMENSIONAL DISTRIBUTION

on attributes which are predictive of some criterion. For example, if response to a tranquilizing medication is used to define a type, individuals with widely differing characteristics and disorders may all be grouped together. Such a type would have very little usefulness beyond the area in which it was developed. For each new criterion a new type would have to be formed. By contrast, natural types are formed solely from the frequency distribution of entities in the score space produced by the measurement dimensions. No constraints are imposed to produce any particular kind or number of types or dimensions; the types so formed are of "like nature" and can be related empirically to any number of criteria or external variables.

Advantages of Typologies

For the human user, taxonomic schemes can reduce the information processing and storage demands made on him, serve as a mnemonic devise and facilitate communication. Since a unique pattern defines a type, members can be identified, remembered, and differentiated from non-members with comparative ease. In addition, one is able to make use of all information which exists about a type, i.e., by knowing an individual's type classification one can make inferences to a large number of attributes or traits.

One of the most important advantages of a typology is that it can help to identify regularities or laws which would otherwise be obscured in mixed groups. Two types of individuals, for example, if they obeyed different laws in some situation, might simply cancel each other out if combined for analysis.

When relationships are strongly non-linear between predictor and to-be-predicted variables, a typology can enhance prediction. Complex derivatives, interaction effects, higher order dependencies and what Cattell[4] calls "functional emergents" (non-linear functional relationships to a criterion) are capitalized upon in typological prediction whereas they are usually ignored in multiple linear regression. This is a case where the whole is more than the sum of its parts.

Other advantages to typological prediction[5] are: 1) the homogeneity for certain types may be so high as to correspond to zero error of prediction for entities in that type; 2) types with scores on a dependent variable which are more heterogeneous than that for the total sample can be identified, i.e., one can know for whom one cannot predict as well as those for whom one can predict some criterion; 3) no particular mathematical model is required. Type membership is directly the determiner of prediction.

Sources of Types

Cattell[6] has suggested three general ways in which multimodal, non-normal distributions may arise when people are the entities and personality characteristics or social behavior are the dimensions of measurement. The first of these, sociological patterns, has to do with "fitting in" to some niche or function. "Where there is affiliation or non-affiliation, civilized specialization, and specific situationally determined personal histories,

there will be non-normal and discrete distributions of single traits and patterns of traits -- in short, species types." Patterns may reflect the influences of social institutions, (family, school, church, social class) role positions (wife, husband, occupation), and so on and, insofar as these influences differ within the society, they will generate multimodal distributions.

Genetic patterns may be generated through natural selection of genes or gene combinations or through the segregation of groups of genes (as in races or tribes).

Finally, patterns may be created by response to specific disease agents. Disease syndromes in physical medicine present obvious examples where many attributes are conjointly affected, but similar phenomena occur in psychopathological or sociopathological disorders. The work of Lorr[7] and of Kulik, et al.[8] present examples of the latter.

Identifying Types

While in fields such as zoology types may immediately "stand out" as perceptual wholes, this is seldom the case in the behavioral sciences. Especially when data is multidimensional with large numbers of cases, it is difficult to locate regions of high density and segregation (modes) simply by visual scanning. Instead, recourse is made to statistical means for locating groupings of objects with high mutual similarity.

The first step in typological analysis is to decide upon a set of attribute dimensions for comparing individuals. Ideally, all major dimensions of variation in the attribute domain of interest should be included so that important factors are not left out in the determination of similarity between entities. Unfortunately, to do so in areas of study requiring human subjects is often virtually impossible: an extraordinary time commitment might be required of each person and the number of individuals needed to obtain reliable modal points would be huge. In addition, the independence of measures could not be assured so that the efficiency of subject characterization would not be maximal. (The latter problem might be circumvented by a procedure such as factor analytic reduction of variables to a smaller set of independent dimensions prior to scoring the entities).

After entities are measured on each of the variables or dimensions, one can proceed directly to search this multidimensional "space" for modes by the "systematic space density search method." That is, one divides the coordinates into convenient intervals and counts the number of entities in each "square." There are technical difficulties with this approach, however, in that the number of units to be counted becomes very large as the number of variables and intervals increases.

In the alternative approach, the "inter-id (entity) relational approach,"[9] some index of similarity between entities is sought and pair-wise comparisons are made between each subject and every other subject as an intermediate step to finding areas of high

density and segregation. (The positions of types in the score space are found later.) The correlation coefficient is usually rejected for this purpose because it does not reflect differences in profile level and steepness. A distance function, based on the Pythagorean theorem ($a^2 = b^2 + c^2$) but generalized to any number of dimensions, is frequently used either directly or corrected for differences in measurement units, number of dimensions, and distance values to be expected by chance (as in Cattell's r_p).

Finally, a method for searching a matrix of similarity indices and finding groupings of entities, if they exist, must be selected. Although a number of procedures have been devised for this purpose,[10] only the one used in the present study will be described.

The BC-TRY O-Typing[11] procedure combines aspects of both the systematic space density search and inter-id relational approaches. That is, a set of arbitrary sectors of the k-dimensional score space ("hyperspace") is initially defined. For example, if five dimensions are each divided into fourths, one obtains 1024 sectors. The pattern of scores defining each sector are computed and entities are sorted into one of these sectors on the basis of their score patterns. Sectors containing two percent or more of the subjects are retained and the other sectors discarded.

Centroids for each of the occupied sectors are then computed. A centroid of a cluster of points is that point from which the sum of the deviations of observed points is zero. These centroids are then used to define clusters. The initial arbitrary sectors are discarded.

The distance in hyperspace between each subject and each centroid is computed and subjects are reassigned to centroid clusters on the basis of the smallest distance. Some subjects are shifted from one centroid to another in the process. Clusters are discarded if they lose all their members by reassignment and, if the distance between two clusters is smaller than some criterion value, the clusters are merged.

After reassignment, new centroids are computed and the subjects again reassigned to clusters. This iterative process continues until cluster membership shows no change in any reassignment cycle. Within these final clusters ("O-types") the intercorrelations between cluster scores are essentially zero, i.e., the scores of all subjects are about the same.

Typological Prediction

Once types are identified they can be treated like any other set of categories. Thus, associations between type and "outside" variables may be found by analysis of variance, t-test, chi-square, etc. In the BC-TRY system comparisons are made between each type and the total set of scores. For each O-type, the program draws

random samples of a size determined by the size of the O-type from the full sample of scores on the dependent variable. The distribution of the means and homogeneities of these samples are plotted and compared with the mean and homogeniety of the O-type of interest. The probability of the O-type mean being different from the mean of the full sample is given by the proportion of sampled means smaller or larger than that observed for the O-type. No assumptions about the form of the score distribution of the dependent variable are necessary.

CHAPTER 4

METHODS

Subjects

Data were collected from 166 medical students[1] at the University of New Mexico School of Medicine. This number represents about 90 percent of all potential student responders. Except for career preference ratings, which were collected at the end of the 1971 school year, all questionnaire data were collected in 1970. Academic performance, MCAT and National Boards information was retrieved at appropriate periods. The numbers of subjects in each class were as follows:

Class of 1974	n = 48
Class of 1973	n = 34
Class of 1972	n = 37
Class of 1971	n = 26
Class of 1970	n = 21
Total	n = 166

Because of missing data on some subjects for some variables, the total number of subjects fluctuates from analysis to analysis.

Isolation of the Personality Types

Responses to two personality inventories provided the basic data for the personality typology. The 16-Personality

Factor Questionnaire[2] is a factor analytically derived set of 16 scales:

A. Sizothymia (reserved) vs. Affectothymia (outgoing)

B. Low Intelligence vs. High Intelligence

C. Low Ego Strength (easily upset) vs. High Ego Strength (emotionally stable)

E. Submissiveness vs. Dominance

F. Desurgency (serious) vs. Surgency (happy-go-lucky)

G. Weak Superego Strength (expedient) vs. Strong Superego Strength (conscientious)

H. Threctia (shy) vs. Parmia (socially bold)

I. Harria (tough-minded) vs. Premsia (tender-minded)

L. Alaxia (trusting) vs. Protension (suspicious)

M. Praxernia (practical) vs. Autia (imaginative)

N. Artlessness (unpretentious) vs. Shrewdness (socially aware)

O. Untroubled Adequacy (self-assured) vs. Guilt Proneness (self-reproaching)

Q_1 Conservativism (respecting of traditional ideas) vs. Radicalism (experimenting)

Q_2 Group Adherence (group dependence) vs. Self-Sufficiency (prefers own decisions)

Q_3 Low Self-Sentiment Integration (undisciplined self-conflict) vs. High Strength of Self-Sentiment (controlled, socially precise)

Q_4 Low Ergic Tension (relaxed) vs. High Ergic Tension (tense, driven)

The uncommon labels attached to some of these scales are a result of its method of construction: dimensions were discovered and identified on the basis of empirical evidence and not forced to fit a priori concepts. Most

of the dimensions have emerged in analyses of behavior ratings, life history data and laboratory behavioral tests, as well as in questionnaire data.

The second personality inventory, the Myers-Briggs Type Indicator[3], is based on Jungian personality theory and purports to measure four broad aspects of personality:

> Extraversion or Introversion: the preference for directing one's perception and judgment upon one's environment or towards the world of ideas.
>
> Sensing or Intuition: reliance on direct perceiving through the five senses or reliance on indirect perception via the unconscious.
>
> Thinking or Feeling: the preference for judgment arrived at on an impersonal, true-false basis or on the basis of personal valuation of the object.
>
> Judgment or Perception: reliance on judgment processes (Thinking or Feeling) or reliance on perceptive processes (Sensing or Intuition) in dealing with the outer world.

Both of these inventories have a large amount of research literature associated with them[4] and have been used in studies of medical students and physicians[5]. Combined they provide fairly broad coverage of attributes occurring in "normal" populations.

When the 24 scales were subjected to variable cluster analysis (factoring), five relatively independent second-order dimensions were obtained[6]:

1. Extraversion vs. Introversion was defined by the scales of the same names on the Myers-Briggs plus the "Parmia vs. Threctia" scale on the 16-PF. Moderate loadings occurred on the "Surgency vs.

Desurgency" and "Self-sufficiency vs. Group Adherence" scales of the 16-PF.

The dimension seems to represent social extroversion as it is commonly understood and corresponds to Cattell's second-stratum factor of "Exvia vs. Invia." The high scorer is socially bold, likes interpersonal contact, is talkative, enthusiastic and impulsive. The low scorer is shy, introspective, silent, inhibited in self-expression and may be troubled by feelings of inferiority.

2. Rule-Bound vs. Unconstrained was defined primarily by the "Judging" and "Perceiving" scales of the 16-PF. The "Strength of Self-sentiment" scale achieved moderate loadings in three of the four analyses performed.

The dimension appears to oppose a preference for order, control and planning to a preference for spontaneity and novelty. The person scoring at the "Rule-Bound" end is concerned with moral standards and with his social image or reputation. He may be regarded by others as compulsive, socially precise and responsible. The person scoring at the "Unconstrained" pole may be seen as frivolous, self-indulgent or lax. The dimension seems to represent the extent to which behavior

is self-controlled by adherence to exacting, socially-approved standards or ideals.

3. Feeling vs. Thinking loaded the Myers-Briggs scales of the same names as well as "Premsia vs. Harria" on the 16-PF.

Corresponding to Cattell's second-stratum factor of "Pathemia vs. Cortertia," a sympathetic, tender-minded, humanistic approach is represented at one end of the dimension while a preference for logical, impersonal judgment is represented at the other end. The person scoring at the "Thinking" end is self-reliant, unsentimental, and keeps to the point in group discussion. The "Feeling" individual is likely to be described as expecting affection and attention, sensitive, indulgent, and, often, socially concerned.

4. Divergence vs. Conventionality of Thought was defined primarily by the "Sensing" and "Intuiting" scales of the Myers-Briggs with "Autia," "Radicalism" and "Dominance" achieving low to moderate loadings.

The low scorer is practical and accepts the limitations of traditional conceptualizations whereas the high scorer is fascinated by the world of ideas and stresses originality, innovation, experimentation and complexity.

5. Anxiety vs. Adjustment was defined only by 16-PF scales ("Ergic Tension," "Ego Strength," "Guilt Proneness," "Protension," "Strength of Self-sentiment," and is equivalent to Cattell's second stratum factor of the same name.

The high scorer is easily upset, feels distressed, worries and experiences inner conflict. He may be moody and irritable and project his tension upon environmental events. The low scorer is mature, relaxed, resilient in the face of adversity, and possesses an integrated and acceptable concept of self. The very low scorer may lack the motivation for persisting at difficult tasks.

Factor scores were computed for each subject on each of these five dimensions and the BC-TRY O-Typing procedure applied. The mean factor scores for the twelve types which were identified by this analysis are shown in Table 1 along with the percent of students falling into each type and a measure of the "tightness" of subject scores within each type (an average homogeneity of 1.00 would mean that every subject in the type achieved exactly the same scores on all five dimensions).

Ten of the twelve types have at least one score dimension for which its mean is one or more standard deviations from the mean for the total group. In terms of personality

Q-TYPES	CLUSTERS I. Rule-Bound	II. Extra-version	III. Feeling	IV. Intuition	V. Anxiety	Average Homo-geneity	Percent of Students
1.	34.87	52.49	56.46	59.14	58.38	.87	08
2.	37.76	34.23	52.93	57.97	56.00	.76	07
3.	35.83	52.51	68.03	59.21	50.48	.85	06
4.	55.94	43.40	35.17	43.33	54.74	.79	11
5.	54.66	40.41	49.51	37.21	52.04	.78	09
6.	47.42	57.34	47.67	49.04	36.39	.91	06
7.	49.91	47.40	45.85	52.66	49.57	.86	13
8.	44.42	47.84	53.71	50.70	72.97	.84	05
9.	53.24	52.67	57.25	57.70	41.76	.84	13
10.	53.10	55.34	61.92	35.14	50.77	.88	04
11.	57.30	63.51	43.73	57.43	46.13	.86	09
12.	63.01	59.39	48.43	37.04	42.27	.82	09

TABLE 1

MEDICAL STUDENT TYPE SCORES AND HOMOGENEITY

characteristics, then, the types are highly distinctive. The "average" medical student type, Type 7, is average in both the sense that it has the largest number of members and in the sense that scores on the five dimensions are near the means for the total group. However, this average category includes only a small percentage of the total group.

Figure 3 depicts the similarities and differences between types in terms of a hierarchical condensation chart. The basic types can be merged into higher-order types of subjects on the basis of the distance (in five-dimensional space) separating them. Thus, Type 1 and Type 3 merge to form a new type at a Euclidean distance of about 14. This new type, in turn, can be merged with Type 2 if the distance criteria is relaxed to a value of 20.5. At the tip of the pyramid all groups are merged into one large type embracing all individuals.

The Predicted Variables

For each of the twelve types, on each of 105 continuous variables, a mean and standard deviation were calculated and compared to a distribution of 300 means or standard deviations computed from random samples of scores selected from the total pool of scores on the variable. In addition, deviation from chance occurrence was evaluated for 15 non-continuous variables by means of the X^2 test. Brief descriptions of the variables are given below.

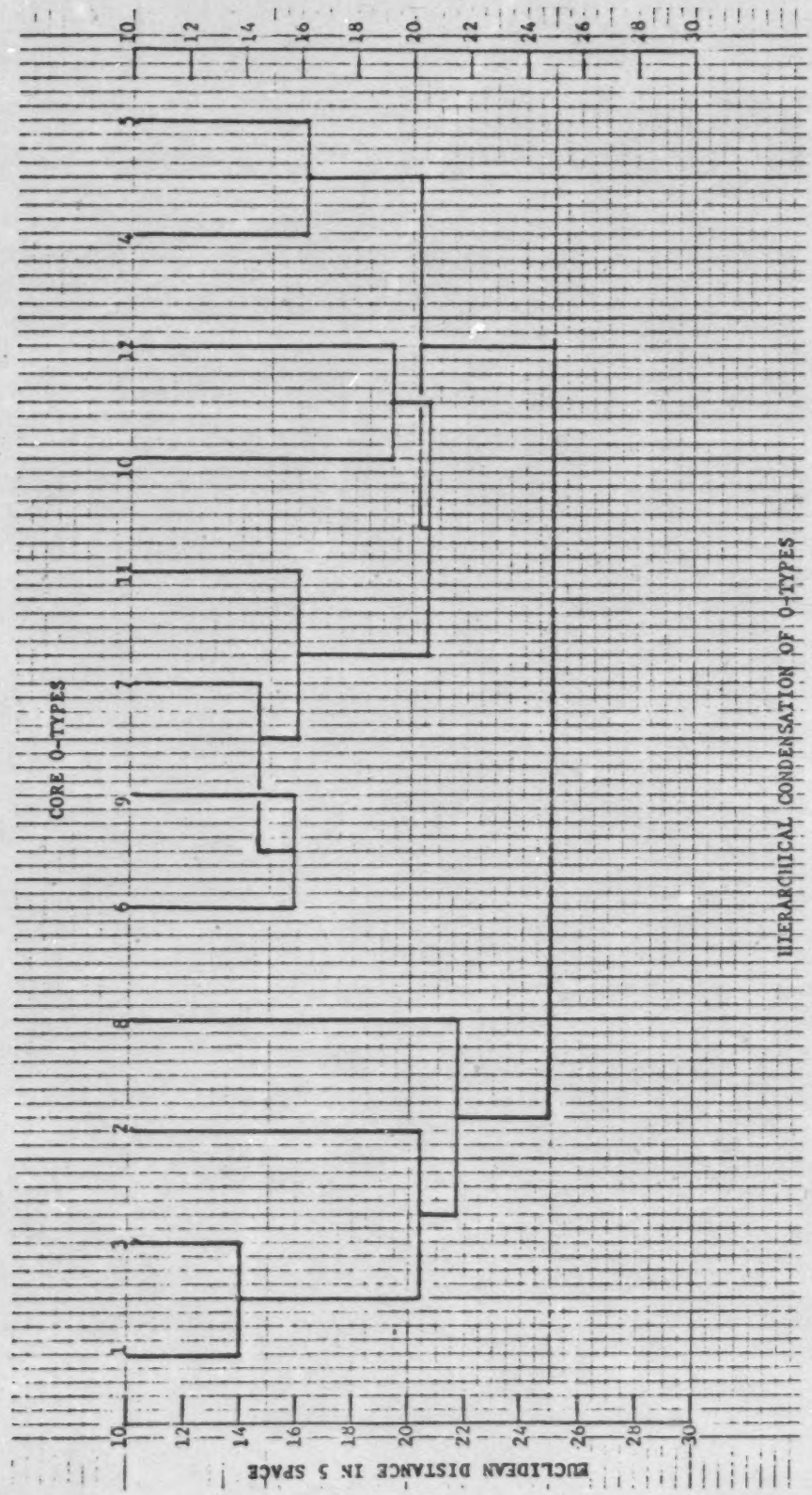


FIGURE 3

HIERARCHICAL CONDENSATION CHART FOR THE TWELVE MEDICAL STUDENT TYPES

Student-Faculty Role Questionnaire[7]

The Student-Faculty Role Questionnaire (SFRQ) was designed to identify significant dimensions of the student-faculty relationship and to assess individuals with respect to these dimensions. Its items are of two types: expectation items which request judgments about the importance of certain student and faculty behaviors; and perceived enactment items which request judgments about the degree to which expectations are seen as being met in the subject's current situation. Separate cluster analyses were performed on the expectation items and perceived enactment items as well as on the set of scores derived from the discrepancies between matched pairs of expectation and perceived enactment items.

In the expectation realm (SFRQ-1) the variables measured are:

1. Ideal Student Role: the degree to which students should really invest themselves in the work of a course, seriously consider what faculty say, be enthusiastic about learning, show interest in course material, be punctual, show academic scholarship, be orderly and productive, etc.
2. Academic vs. Clinical Orientation: the importance of becoming a good teacher, being theoretically oriented, developing research skills, as opposed to the importance of becoming a good clinician, being practically oriented, gaining experience working with patients.

3. Psychosociocultural Sensitivity: the value placed upon learning about psychological, social and cultural factors in so far as they are relevant to patient care and augment clinical ability.
4. Faculty Professional Activity: the importance attributed to faculty involvement in non-teaching professional affairs: community participation, research, clinical work, medical school affairs.
5. Faculty Accommodation: the importance of faculty members adjusting their instructional format to student suggestions and needs.
6. Desire for Informal Relations with Faculty: the importance of informal contacts with faculty members, e.g., informal discussions, one-to-one talks, social affairs, office visits.
7. Division of Responsibility in Teaching: the relative influence of faculty as opposed to students in preparing educational materials, deciding what's important to learn, providing instruction, determining educational methods.
8. Desire for Structure: the importance of faculty giving prompt feedback, specifying what is required, encouraging questions and discussion, giving recognition for accomplishments, evaluating by regular tests.

In the perceived enactment realm (SFRQ-2) eight variables are measured, some of which correspond to ones in the expectation realm. The variables are:

9. Ideal Teacher Role Enactment: the perceived quality of faculty teaching behavior: being orderly, productive, well-organized, interesting, good at lecturing, able to excite student curiosity, etc.
10. Perceived Division of Influence in Education: the perception variable corresponding to "Division of Responsibility" in expectations.
11. Perceived Psychosocial Emphasis: the enactment form of "Psychosociocultural Sensitivity."
12. Perceived Faculty Considerateness to Patients: the way faculty are perceived as conducting themselves with patients, e.g., requesting permission from patients for procedures to be carried out, explaining procedures to patients, being considerate.
13. Perceived Faculty Socio-emotional Role Enactment: the degree to which faculty members are seen as going out of their way to be helpful to students, giving recognition, encouraging informal visits and one-to-one talks, being friendly and supportive, helping students work out problems and understand themselves.

14. Perceived Emphasis on Student Personal Development: the amount of emphasis seen as placed on students finding purpose or meaning in their professional roles, learning to understand themselves and the complexities of the world.

15. Perceived Theoretical-Research Emphasis: the perceived amount of emphasis given to research and theoretical work.

16. Perceived Faculty Provision of Structure: the perception form of "Desire for Structure" in expectations.

Discrepancy scores (SFRQ-3) were obtained by subtracting standard scores for expectation items from corresponding standard scores for perceived enactment items, than standardizing the resulting difference measures. These scores are presumably an index of the degree of satisfaction or dissatisfaction with the phenomena mentioned in the item, corrected for initial level of expectation. The dimensions measured are elaborated upon only if they did not appear in the expectation or perceived enactment domains.

17. Faculty Socio-emotional Role Enactment

18. Psychosocial Emphasis

19. Student vs. Faculty Influence

20. Community Emphasis: satisfaction/dissatisfaction with emphasis on learning to use community agencies and learning to use information from non-medical specialists.

21. Faculty Teaching Efficiency: satisfaction/dissatisfaction with the orderliness and productivity of educational sessions.

22. Faculty Considerateness to Patients

23. Involvement in Extracurricular Affairs: both student and faculty involvement in activities outside the medical school are included in this dimension.

24. Student Personal Development

Physician Ideology Questionnaire[8]

The Physician Ideology Questionnaire (PIQ) was designed with the intention of identifying some of the dimensions along which respondent values may vary regarding what an "ideal" physician is and how he acts. Items of the questionnaire call for judgments (on five-point scales) regarding the importance or value of various kinds of physician behavior, e.g., the respondent is asked his degree of agreement or disagreement with the statement "Adequate treatment cannot be done unless the doctor's authority over all aspects of patient care is clearly established and preserved." Cluster analysis of responses to the items revealed nine dimensions:

25. Nurse vs. Physician Responsibility for Information Exchange measures the responsibility allocation (nurse vs. physician) for information-getting and giving functions between care-givers and patient

plus family. Individual's scoring at one end of the dimension see discussion of a patient's condition and post-hospital plans, of resources for rehabilitative care, of planned tests and procedures, and of the patient's home and family situation as responsibilities of the nurse, whereas those scoring at the other extreme would consider them to be physician responsibilities.

26. Community Orientation measures the degree to which physician involvement in professional activities in the community is seen as important or desirable.

27. Empathy and Rapport with Patients measures the degree to which it is seen as desirable that the physician be able to create a warm, relaxed, understanding atmosphere in which patients feel free to express their feelings, i.e., the importance of a good "bedside manner."

28. Nurse Housekeeping Role measures the degree to which nurses should assume responsibility for carrying out housekeeping directives, e.g., maintaining high standards of efficiency and cleanliness, making sure patients comply with instructions, investigating complaints about housekeeping matters.

29. Patient Knowledge of Diagnosis measures the importance attributed to the physician giving detailed explanation to the patient and his family of the medical problems.

30. Psychological Healer Role measures the importance of the physician being able to treat emotional and social problems of patients.

31. Psychosocial Orientation measures the value seen in the physician being able to explore social and emotional aspects of patient problems, use social and welfare agencies, and work in a treatment team; being up to date with behavioral science knowledge.

32. Disease Orientation measures the degree to which it is considered desirable for the physician to concentrate his efforts on the technical aspects of diagnosis and treatment and leave to others the responsibility for dealing with uncooperative, neurotic patients and their psychological, social and economic problems.

33. Physician Authority measures the importance attributed to the physician having primary control over his work setting and all aspects of patient care.

Career Ratings[9]

Using seven point scales, students were asked to rate their inclination or disinclination to practice in fifteen

areas of medicine and six practice settings. These variables are:

34. Anesthesiology
35. Basic Medical Science (e.g., Pharmacology, Physiology)
36. Dermatology
37. Epidemiology, Community Medicine, Public Health
38. Family Medicine, General Practice
39. Internal Medicine (including Cardiology, Neurology, Urology, etc.)
40. Obstetrics-Gynecology
41. Orthopedics
42. Ophthalmology
43. Otorhinolaryngology
44. Pediatrics
45. Psychiatry
46. Radiology
47. Pathology
48. Surgery
49. Private practice, solo
50. Private practice, group
51. Public institution or agency (government hospital, city-state health department, etc.)
52. Private institution or agency (industry, hospital, independent foundation)
53. Research
54. Education

Ratings of these twenty-one variables were then cluster-analyzed to yield five dimensions:

55. Referral Specialties
56. Academic-Research
57. Institutional practice
58. Surgery
59. Primary care

Academic Ability and Achievement Measures

60. MCAT Verbal score
61. MCAT Quantitative score
62. MCAT General Information score
63. MCAT Science score
64. MCAT Average score
65. Undergraduate grade point average
66. Success Score Year I (The "Success Index" was a rating on a scale [one to nine] derived by review of all promotion committee meeting notes and subject block grades and reflects overall performance for the year.)
67. Clinical Science I grade[10]
68. Medical Biology I grade[11]
69. Success Score Year II
70. Clinical Science II grade
71. Medical Biology II grade
72. Anatomy section score, National Boards Part I
73. Physiology section score, National Boards Part I
74. Biochemistry section score, National Boards Part I
75. Pathology section score, National Boards Part I
76. Microbiology section score, National Boards Part I
77. Pharmacology section score, National Boards Part I

Academic achievement measures for the last two years of medical school were not yet available for enough subjects in the sample to make typological predictions.

Perceptions of Goals of the Medical School

Judgments were obtained (on one to seven scales) as to the "end product" goals of the medical school. The alternatives rated were:

78. to develop clinicians
79. to develop researchers
80. to develop administrators
81. to develop teachers

Preferred Methods of Learning

Students were asked to rank seven educational methods in terms of their "learning best". Retrospective judgments about their choices when entering medical school constituted one set of scores and current judgments constituted another set. The variables were:

82., 83. Didactic lectures (student led)
84., 85. Didactic lectures (instructor led)
86., 87. Group discussion (student led)
88., 89. Group discussion (instructor led)
90., 91. Independent study projects
92., 93. Clinical rounds and conferences
94., 95. Tutorials

Use of Leisure Time

In order to get some idea of collateral role activity preferences, subjects were asked to indicate the frequency that they engaged in various kinds of leisure time pursuits. Using a five point scale ("daily" to "less than monthly") they rated:

96. Meeting of civic, church, political or other task-oriented groups.
97. Structured recreational groups (such as team sports, bridge clubs, drama clubs).

98. Professional groups (having to do with medicine or medical school).
99. Individual or solitary activity (hobby, sports, music, reading).
100. Informal or unstructured outings or entertainment with friends.
101. Recreation with only family.

Biographical Variables

The following variables were selected from a biographical questionnaire administered to the subjects. Scaling and/or categories are specified only where they are not obvious. Categories were collapsed for some analyses.

102. Father's Occupational Status (Hollingshead Index).
103. Mother's Occupational Status (Hollingshead Index).
104,105. Father's Educational Level/Mothers Educational Level (1. Graduate and/or professional training. 2. College graduate. 3. Some college. 4. High school graduate. 5. Some high school. 6. Junior high school. 7. Less than seven years of school.)
106. Number of boys in family of origin
107. Number of girls in family of origin
108. Sibling position
109. Sex
110. Religion
111,112, 113. Size of community of origin at ages 0-7/8-13/14-18 (1. Large Metropolitan area [100,000+]. 2. Suburb of large metropolitan area. 3. Medium-sized city [26,000 -- 99,999]. 4. Small town [500 -- 25,999]. 5. Rural Area.)
114. Father's Occupation: Medical vs. non-medical
115. Mother's Occupation: Medical vs. non-medical

116. Undergraduate major subject (biological sciences, physical sciences, social sciences, humanities, fine arts or architecture, education, engineering, business, economics, health professions, home economics, other).

117. Educational status (1. less than BA or BS degrees. 2. BA or BS degree. 3. Bachelors degree + graduate credits. 4. MA or MS degree. 5. MA or MS degree + graduate credits. 6. All but thesis for PhD. 7. PhD degree. 8. DDS, OD or MD degree).

118. Occupational experience (medical care settings, helping activities, research or technical, teaching, dealing with public, unskilled labor, other).

119. Marital Status

120. Percent Financial Support (parents, spouse, self, scholarship, loan, GI Bill, other).

CHAPTER 5

RESULTS AND DISCUSSIONS

Because of the large amount of data and the unfamiliarity of many of the variables to most readers, the format of this section deviates in several respects from that of the usual research report. In order to facilitate comprehension and not tax the reader's memory capacity, results and the discussion of results are presented together for each type. In addition, interpretations of scales are frequently substituted for the actual scale names. Separation of findings from inferences or speculation should be apparent from wording or context. However, several cues can be used to identify empirical findings. Statements of results are always followed, in parentheses, by the probability that the finding could have occurred by chance. In cases where it may not be clear which variable is being referred to, the variable number will preceed the probability level within the parentheses. Finally, the results for each variable for each type are given in Appendix B.

Unless otherwise specified, comparisons are always between the mean value which the type achieves on the variable and the mean value for all subjects combined. Findings which are significant between the .05 and .10 probability levels are always referred to as "trends" or "tendencies."

Within each type, the following order of presentation is adhered to. First, the type means for each of the five defining personality dimensions are presented along with an interpretation

of the pattern derived from validation studies of the variables which make up the dimensions. Then, findings from analyses performed in the present study are set forth.[1] These results are grouped into the following categories: academic performance and ability; preferred methods of teaching/learning; perceived goals of the medical school; student-faculty relations; elements of professional identity; and use of leisure time. Finally, a capsule summary of the type is presented.

Type 1

Students are identified as belonging to this type by the following pattern of scores:

Low Rule-boundness ($\bar{X}_1$ = 34.87)
Average Extraversion ($\bar{X}_1$ = 52.49)
Moderately High Feeling ($\bar{X}_1$ = 56.46)
High Divergence of Thought ($\bar{X}_1$ = 59.14)
Moderately High Anxiety ($\bar{X}_1$ = 58.38)

The image conjured up by this kind of profile is of persons who are sensitive and eager to help others, who take a humanistic approach to interpersonal relations in both receptive and assertive ways. Their preferences are for improvisation and spontaneity rather than preparation and self-restraint. In some contexts this may be valued as "flexibility" and "adaptiveness" while in others it may be condemned as "frivolousness" and "laxity." Individuals of this type value original and innovative approaches to problems more than practical, down-to-earth ones. In view of the reputed regimentation of medical school, it is not too surprising that the amount of subjective

distress is high in these students. As will be seen below, this facet of Type 1 students stands out in the predicted variables.

Academic Performance and Ability

The mean undergraduate grade point average for Type 1 is the highest of any of the types but the large amount of within-group variability prevents them from being significantly different from the mean for all individuals combined (proportion of randomly obtained means falling above the Type 1 mean = .120).

On the MCAT Type 1 means are generally above average, although this approaches statistical significance only on the General Information subtest ($p = .057$). The MCAT pattern for Type 1 -- high: Verbal, General Information and Science; low: Quantitative -- suggests individuals who are broadly "tuned in" to the world of ideas but neglectful of detail. This picture is consonant with the high "Divergence of Thought" scores and the low "Rule-boundness" scores of the type.

During their first year in medical school Type 1 students achieve significantly higher over-all success ratings ($p = .040$) and significantly better grades in Medical Biology I ($p = .007$). However, by the end of the second year, these same students have fallen to below average in over-all success ($p = .023$). And, on National Boards, Part I, they do not perform as one might expect from their MCAT scores and first year performance: type means for the Anatomy, Physiology and Biochemistry sections are slightly below average (but not significantly so), while mean scores for

for Pathology, Microbiology and Pharmacology are at or slightly above the mean. One might hypothesize that these results are due to the greater disillusionment experienced by Type 1 subjects rather than to any deficiency or falling off in abilities. They may either lack the motivation to study or they may discount the importance or relevance of performance on National Boards. One might expect a higher than average drop-out rate during the second year for subjects in Type 1.

Preferred Methods of Teaching/Learning

On entry to medical school Type 1 subjects tended to dislike faculty led group discussions more than their peers ($p = .067$). One might suspect that this again reflects their desire for freedom and spontaneity.

Perceived Goals of the Medical School

Students in this type perceive the goals of developing clinicians and teachers as less important to the medical school than do their peers ($p = .000$ and $.007$ respectively); they tend to see the goal of developing administrators as less valued ($p = .063$). One might suspect that these lower ratings reflect their general pessimism about medical school.

Student-faculty Relations

In terms of their student roles, members of Type 1 appear to want greater freedom from traditional notions of how students "should" behave. And faculty members are expected to augment these desires

by adjusting their teaching styles to student needs and suggestions. On the SFRQ (Expectations), Type 1 students tend to place less value on students enacting Ideal Student Role behavior ($p = .063$), and they place significantly greater importance than their peers on Faculty Accommodation ($p = .010$). This seems consistent with their low Rule-boundness scores in the personality realm.

Their humanistic orientation seems to be reflected in the direction of their scores on some of the other SFRQ variables (although the differences from grand means did not achieve statistical significance): the Type 1 means were on the side of greater clinical (vs. academic) orientation; a greater desire for emphasis in the curriculum on sensitivity to psychological, social and cultural aspects of medicine; and a greater desire for relating informally to faculty members. Type 1 subjects did tend to be more homogeneous in their Desire for Informal Relations with Faculty scores (on the side of greater importance) than one would expect by chance ($p = .077$).

When perceptions of current student-faculty relations are considered, Type 1 stands out from every other type in their extreme assessments on four of the eight SFRQ-2 scales. They see a significantly smaller proportion of the faculty enacting Ideal Teacher Role Behavior (9, $p = .007$); Socio-emotional Role Behavior (support, encouragement, etc.) ($p = .003$), and emphasizing Student Personal Development ($p = .020$). They also see less emphasis in the curriculum on Psychosocial Aspects of Medicine (11, $p = .000$).

The nature of Type 1 discontent is clarified by viewing their SFRQ discrepancy scores (perceptions corrected for level of expectations). They see faculty as neither less efficient (orderly, productive) in their teaching roles nor less considerate towards patients than is desired. With Type 1s it is more personal than that. They "feel" the problem as a lack of emphasis on students' finding purpose or meaning in their professional roles, learning to understand themselves and the world (24,p = .040); as a deficiency in the helpfulness, friendliness, informality and supportiveness of faculty (17,p = .017); and as a lack of emphasis on factors related to some of their "core" operating characteristics, namely, "feeling" as reflected in psychosocial emphasis (p = .003) and "unconstrainedness" as reflected in the perception of greater than desired faculty influence in the determination of the educational process (19,p = .047).

Elements of Professional Identity

The image of the "ideal" physician held by members of Type 1 also reflects the biases of more general personality dispositions. On the PIQ, Type 1 students attributed greater importance to the physician being able to <u>treat</u> emotional and social problems of patients (30,p = .000) as well as to <u>explore</u> these aspects of a patients' situation, using social and welfare agencies or members of a treatment team for remedial action (31,p = .057). Type 1 placed significantly less importance on the physician having control over his work setting and patient care (33,p = .010). Interestingly, Type 1 saw slightly <u>less</u> value in the physician having a good

"bedside manner" (in the sense of being able to create a warm, relaxed understanding atmosphere with patients). Although this difference was not statistically significant, members of the type did tend to be grouped together around this lower value (27, $p = .060$). Whether members of the type see this kind of behavior as some kind of constraint on their freedom of action or as a detached and "technical" relatedness (as opposed to a "feeling" type of relatedness) cannot be inferred from the data.

In terms of specialty preferences, Type 1 students rated themselves significantly more inclined towards Internal Medicine than their peers ($p = .037$). They tend to avoid Radiology ($p = .053$), group together ($p = .073$) just below the grand mean preference for Otorhinolaryngology and group together ($p = .047$) at the mean of the Referral Specialties cluster. Mean scores on the Institutional Practice and Surgical Specialties clusters were low, but not significantly so.

Use of Leisure Time

Compared to their peers, students in Type 1 report significantly more time spent in structured recreational groups ($p = .007$ and in individual or solitary activity ($p = .000$) and significantly less time in family recreation ($p = .010$).

Summary of Type 1

In summary, the members of Type 1 might be termed "Disillusioned Idealists." They seem to be capable individuals who enter medical school expecting a good deal of freedom of action and "outlets" for their desires for personal growth and humanistic relatedness. After what may be an initial spurt of enthusiasm in the first year, they become

disenchanted with medical school and earn poorer evaluations of their performance than would be expected on the basis of their abilities alone. The amount of subjective distress (anxiety, depression, resentment, etc.) which they experience is greater than that of other medical students. They seem to be headed in the direction of Internal Medicine as a specialty area.

Type 2

In order to be classified in Type 2, students must have the following pattern of personality scores:

Low Rule-boundness ($\bar{X}_2$ = 37.76)
Low Extraversion ($\bar{X}_2$ = 34.23)
Average Feeling ($\bar{X}_2$ = 52.93)
Moderately High Divergence of Thought ($\bar{X}_2$ = 57.97)
Elevated Anxiety ($\bar{X}_2$ = 56.00)

Individuals belonging to this type are likely to be described as socially shy, introspective, quiet, and inhibited in self expression.[2] They may be bothered by feelings of inferiority or lack of self-confidence. They tend to be imaginative and intellectually curious, interested in the content of their work or study as opposed to the social or economic gains they may receive from it. The Type 2 individual is unconcerned with his social image, may be seen as "negligent" in contexts requiring attention to detail and routine or as "adaptable" in contexts not having these constraints (he would prefer the latter situations). However, in what they consider to be "matters of principle" they may not be very flexible.

Academic Performance and Ability

Although the mean undergraduate grade point average for Type 2 is surpassed only by Type 1, it does not differ significantly from the grand mean. However, the within-type variance is significantly ($p = .020$) less than one would expect by chance, so it may be tentatively assumed that these students achieve better than average grades as undergraduates, most likely in science courses.

On the MCAT, Type 2 students tend to do better than average on the Quantitative ($p = .093$) and Science ($p = .057$) subtests and poorer than average on the General Information subtest ($p = .080$). A narrower range of intellectual skill is implied by this MCAT pattern than is the case for, say, Type 1 students.

Type 2 students are more likely to get unsatisfactory grades in the Clinical Science portion of the first year in medical school ($p = .003$), but they do not differ appreciably from the grand means for other parts of the first and second years. One might expect this from their Introversion scores and lack of verbal facility and "roundedness" as evidenced on the MCAT.

On National Boards, Part I, students in Type 2 do not differ significantly from the grand means for any of the sections. The type mean is elevated only on the Physiology section, but this too is not statistically significant.

Preferred Methods of Teaching/Learning

On entry into medical school, students in Type 2 were more likely than their peers to prefer independent study ($p = .020$), clinical rounds and conferences ($p = .020$) and tutorials ($p = .037$).

Apparently these individuals like to learn on their own (for the most part). Group discussions and didactic lectures, whether student or faculty led, do not rank high on their preferred methods.

Perceived Goals of the Medical School

Type 2 students rated the goal of "developing clinicians" significantly lower than their peers ($p = .017$). The goal of "developing researchers," while not differing significantly from the grand mean, elicited significantly more homogeneous responses ($p = .023$), with a mean for the type slightly above average. One might hypothesize that, while Type 1 students rate the goal of developing clinicians below average out of discouragement, Type 2 students rate it low because they feel inadequate in that set of roles.

Student-faculty Relations

As one might predict from their low Rule-Boundness scores, Type 2 students tend to want less structure in the educational setting ($\delta, p = .060$). They place significantly less value on Ideal Student Role behavior than their peers ($p = .007$), i.e., they don't consider it important for students to show interest and enthusiasm, be meticulous and persistent in their work, be considerate of faculty, etc. And, they attribute significantly less importance to faculty professional activity outside of the teaching situation ($p = .020$). These last two results make sense in terms of the Type 2's "essentialist" orientation: he probably does not like to judge, or be judged, on the basis of appearances or surface behavior.

Type 2 students tend to perceive fewer faculty as "ideal" teachers (orderly, productive, interesting, well-organized, good at lecturing) than do their peers (9,p = .073) and to see less emphasis on Student Personal Development (p = .070). However, these differences vanish when their levels of expectations are taken into account, i.e., they expect less and perceive less of these characteristics and so, it is supposed, are not disappointed. This type, more than students in general, perceive the emphasis on learning to use community agencies and learning to use information from non-medical specialists as exceeding desires (20,p = .030). Since this kind of learning requires a certain amount of "extraverting" and Type 2 students are inclined to be socially shy, it is not surprising that they would prefer to avoid such situations. No doubt such situations could "trigger" their feelings of inadequacy.

Elements of Professional Identity

In terms of their physician ideology, Type 2's place less value on the physician being able to establish Empathy and Rapport with Patients (p = .047). One can hypothesize that the "mechanism" which is operative here is devaluation of things one feels he is not good at or is uncomfortable in doing. At the same time, Type 2's tend not to be Disease Oriented (p = .090). That is, they do pay attention to the personal and social aspects of patient care and don't focus all their efforts on the technical aspects of diagnosis and treatment.

The specialty preference ratings of Type 2 students are generally lower than the grand mean for all of the clusters and most of the

individual specialties and work settings. All of the other types are above average on at least two cluster dimensions and several of the individual specialty and work settings variables. This suggests that members of Type 2, as a rule, are not really "taken" with any of the available alternatives. They show significantly greater dis-preference for Obstetrics-Gynecology ($p = .043$) and tend to show less preference for Family or General Practice ($p = .057$) than their peers.

Use of Leisure Time

The distribution of use of leisure time for Type 2 students does not differ appreciably in any way from that of the total sample. The most leisure time is spent in individual or solitary activity -- followed by informal outings with friends, family recreation, professional group activity and participation in structured recreational groups. Task-oriented group activity (civic, church, political, etc.) is slightly (but not significantly) elevated compared to the total group.

Summary to Type 2

One is tempted to summarize the Type 2 students with the term "Loners." They seem to prefer to learn on their own, don't expect much or perceive much to be offered by faculty or other students and shy away from the demands of social intercourse. The hypothesis can be entertained that they "solve" problems which trigger an unfavorable characterization of self (i.e., in the social interaction area) by devaluing the importance of one's "performance" in such

situations. Since most medical positions require some amount of interpersonal relating, perhaps it is not too surprising that Type 2 students have not identified a niche for themselves.

Type 3

Students belonging to Type 3 have the following personality profile:

Low Rule-boundness ($\bar{X}_3$ = 35.83)

Average Extraversion ($\bar{X}_3$ = 52.51)

High Feeling ($\bar{X}_3$ = 68.03)

High Divergence of Thought ($\bar{X}_3$ = 59.21)

Average Anxiety ($\bar{X}_3$ = 50.48)

This profile suggests a person who is concerned with people, warm and sympathetic in his relations with others, sensitive, "tender-minded." He is likely to be described as enthusiastic, spontaneous and insightful, expecially in the interpersonal context.[3] He values creativity and can be imaginative and innovative in circumstances where it is not required that he "keep his nose to the grindstone."

Academic Ability and Performance

The mean undergraduate GPA for the subjects of Type 3 does not differ appreciably from the grand mean. Their MCAT scores, too, do not differ significantly from the means for the total group. The pattern of MCAT scores is similar to that of Type 2 with Quantitative and Science subtests being elevated compared to Verbal and General Information subtests.

The overall Success rating for Type 3 students in the first year of medical school tends to be lower than average ($p = .070$), largely because of significantly poorer grades in Medical Biology I ($p = .017$). Their Clinical Science performance in both first and second year is judged "satisfactory" by faculty (variance = .000). On National Boards, Part I, these students are likely to perform close to the total sample averages except for the Biochemistry section where they tend to be low ($p = .067$). All in all, Type 3 does not appear to stand out (either positively or negatively) in terms of academic ability and achievement.

Preferred Methods of Learning/Teaching

Type 3 students report significantly greater dislike for student-led didactic lectures on entry to medical school ($p = .000$) and at the time of questionnaire administration ($p = .023$). A lower than average rating of student-led group discussions was not statistically significant, although the type variance was smaller than usual ($p = .047$). Faculty-led didactic lectures tended to be rated lower on entry ($p = .077$). The absolute magnitudes of their ratings seem to indicate that they resist both didactic lectures and student leadership, the latter being the stronger tendency. One might suspect that they are oriented more towards faculty than peers as a reference group.

Perceived Goals of the Medical School

No significant differences from the total group means nor trends were found for Type 3 in their ratings of medical school goals.

Student-faculty Relations

Type 3 students place significantly less value on Ideal Student Role behavior than their peers ($p = .007$), a result which appears to be due largely to their Low Rule-boundness. (The Low Rule-boundness types, Types 1, 2 and 3, score at one end of the Ideal Student Role dimension while the high Rule-boundness types, Types 11 and 12, score at the opposite end). They tend to cluster ($p = .093$) on the side of desiring greater structure from faculty, although the difference from the grand mean is not statistically significant. Other than that, the expectations of Type 3 students do not differ from those of the total sample of students.

In terms of perceptions, Type 3 students tend to see fewer faculty emphasizing the student's personal development than their peers (14, $p = .083$). This difference vanishes when corrected for initial level of expectation, however. Both corrected and uncorrected scores on Psychosocial Emphasis are in the direction of "not enough," but these differences are not statistically significant.

Elements of Professional Identity

Type 3 students tend to consider it more important than their peers that an ideal physician have skills as a "Psychological Healer" ($p = .060$) and less desirable that he be "Disease Oriented" ($p = .073$) and have a great deal of authority (33, $p = .100$). All of these characteristics are consonant with the people-centered, tender-minded orientation implied by the personality scores.

The career preference clusters do not significantly distinguish Type 3 students from the total sample. However, ratings of the individual specialities show a number of deviations from the means for the total group. Type 3 students rate themselves as more inclined towards Family Medicine/General Practice ($p = .020$), with the type standard deviation being significantly less than for the random samples ($p = .043$). They are also more interested in Anesthesiology ($p = .017$). They are significantly more disinclined towards Pathology ($p = .007$) and tend to be more disinclined towards Pediatrics ($p = .057$), Orthopedics ($p = .053$) and Dermatology ($p = .063$). The avoidance of specialities focusing on disease processes and the approach towards the "people-dealing" specialities is again consonant with the personality orientation of Type 3. The disinclination towards Pediatrics is a little surprising since this might be considered a high patient contact specialty. Perhaps they view children as primarily being afflicted by disease and not good candidates for reciprocating when the physician wants to play the "Psychological Healer" role.

Use of Leisure Time

Type 3 students report significantly greater amounts of time spent in individual or solitary activity ($p = .010$) and informal outings with friends ($p = .003$) than their peers. Significantly less time is reported to be spent in task-oriented group activity ($p = .010$) and a tendency towards less time in professionally oriented groups appears ($p = .080$).

Summary of Type 3

Type 3 students appear to be a "people-oriented" group but not in the same way as the humanistic (crusading?) Type 1's. They do not appear to be exceptionally bright or scholarly or discontented with their lot. Warm and friendly relationships with others seem, for Type 3's, to be rewarding in and of themselves. They tend to seek occupational settings and value the kinds of role behavior which would make such interaction realizable.

Type 4

The pattern of personality scores for individuals belonging to Type 4 is:

Moderately High Rule-boundness ($\overline{X}_4$ = 55.94)
Moderately Low Extraversion ($\overline{X}_4$ = 43.40)
Low Feeling ($\overline{X}_4$ = 35.17)
Moderately Low Divergence of Thought ($\overline{X}_4$ = 43.33)
Moderately High Anxiety ($\overline{X}_4$ = 54.74)

Individuals of this type have been termed "super-dependable" by Isabel Briggs Myers. They are practical, have good memory for detail, tend to be consistent and are able to support their judgments with facts. Logic, planning and decisiveness are valued characteristics to these individuals. They may have difficulties in understanding the point of view of others who differ from them. Outwardly, these students may be seen as serious, quiet and self-sufficient. They tend to experience some subjective distress.[4]

Academic Performance and Ability

The mean undergraduate grade point average for Type 4 does not differ significantly from the grand mean. MCAT scores also do not differ from those of the total sample.

The overall success rating for Type 4 students in the first year of medical school is significantly higher than average ($p = .043$) due, primarily, to significantly better grades in Medical Biology I ($p = .027$). Although the success rating remains above average in the second year, it is no longer statistically significant.

On National Boards, Part I, the performance of Type 4 students is surpassed only by Type 7. They are significantly higher than average on the Physiology section, ($p = .030$) the Microbiology section ($p = .030$) and the Pharmacology section ($p = .033$) and they tend to be high on the Anatomy ($p = .060$) and Biochemistry ($p = .073$) sections. It would seem that the orientation towards facts and details revealed in personality assessment of these students is more relevant to academic performance and National Boards, Part 1, performance than whatever intellectual abilities are measured by the MCAT. The character of the National Board exam seems to "demand" these personality characteristics.

Preferred Methods of Learning/Teaching

No significant differences or trends were found for Type 4 in their ratings of teaching/learning methods.

Perceived Goals of the Medical School

No significant differences or trends were found for Type 4 in their ratings of the goals of the medical school.

Student-faculty Relations

None of the differences in expectations on the SFRQ achieved an acceptable level of statistical significance for Type 4. However, they tended to be more academically oriented than their peers (2 ,p = .087), to want less faculty accommodation to student needs and suggestions (5,p = .063) and to expect greater faculty involvement in professional activities outside of teaching (4,p = .067). Given that they are oriented toward academic achievement, the last factor mentioned would perhaps increase the "status" of faculty and thus provide them with better "credentials" when seeking internships and residencies.

In terms of perceptions, Type 4 students see significantly less faculty influence in the educational division of responsibility than their peers (p = .040). This reverts to a trend (19,p = .070) when corrected for initial level of expectation. One might hypothesize that these students would like to see faculty run the show in medical school without regard for (other) students' demands or desires and that they would justify this in terms of "getting the facts."

Elements of Professional Identity

Type 4 students place significantly less value on the ability of the ideal physician to play the Psychological Healer Role than their peers (p = .017). They also tend to consider it less important that patients be well informed about their diagnosis (29,p = .070). While not qualifying as either "significant" or as "trends," the type means on other PIQ scales are interesting: they indicate that Type 4

students see less value in the physician being community oriented, establishing emphathy and rapport with patients, taking responsibility for exchanging information with patients and being "psychosocially" oriented; and they place greater value on orientation towards "disease" and physician authority. One might expect them to be "cold" and technical in their dealings with patients, preferring to let the (physical) "facts speak for themselves" and to find it hard to understand the relevance of mental and social phenomena.

As one might have guessed, Type 4 students score significantly higher on the Academic-research Career Preference Cluster ($p = .033$). On the individual career preference variables they show significantly more inclination towards the basic medical sciences ($p = .040$) and educational settings ($p = .010$), while tending to prefer research ($p = .067$) and disprefer working in public institutions ($p = .077$) or solo private practice ($p = .073$).

Use of Leisure Time

A trend towards less frequent use of leisure time in task-oriented groups (church, civic, political, etc.) was found for Type 4 students ($p = .090$).

Summary of Type 4

In summary, Type 4 students might be labeled "Biologically Oriented Academics." Their interest and abilities seem to lie in the acquisition of concrete facts and details. This orientation is augmented by a desire for "freedom of movement" or opportunities for personal expression.

They would prefer to understand the facts of disease, uncomplicated by psychological and social aspects or personal reactions of the physician. Their career inclinations appear to be towards the technical facets of medicine: basic science and research.

Type 5

Students belong to this type if they have the following pattern on the five personality dimensions:

Moderately High Rule-boundness ($\bar{X}_5$ = 54.66)
Low Extraversion ($\bar{X}_5$ = 40.41)
Average Feeling ($\bar{X}_5$ = 49.51)
Low Divergence of Thought ($\bar{X}_5$ = 37.21)
Average Anxiety ($\bar{X}_5$ = 52.04)

These individuals are similar to those in Type 4 but with less subjective distress, less emphasis on logic and impersonal judgment, and even more valuation of "concrete" reality. They are likely to be described as dependable, presevering and responsible. Routine activities and tasks requiring attention to detail and thoroughness are easily assumed by Type 5 students. Socially, they tend to be shy and introverted. They are neither strongly analytic nor strongly concerned with people's feelings. If situations become too complex, they may have difficulty in understanding and communicating.[5]

Academic Performance and Ability

Undergraduate grade point average for Type 5 students is not significantly different from the grand mean for all students, although the

direction of the type mean is above average. Type 5 is also not distinguished by their scores on the MCAT. The MCAT pattern is more similar to that of Type 1 than that of Type 4, i.e., verbal and general information subtests are elevated compared to grand mean scores and the quantitative subtest is depressed.

During the first year of medical school, Type 5 students earn significantly higher overall success ratings ($p = .047$). However, this superiority is not maintained during the second year. On National Boards, Part I, the means for the type closely parallel the means for the total student sample. Except for an initial spurt, then, Type 5 students are not outstanding academically during the first two years.

Preferred Methods of Teaching/Learning

Type 5 students disliked student-led group discussions significantly more than their peers on entry to medical school ($p = .040$) and tended to have the same feelings at time of questionnaire administration ($p = .087$). They significantly <u>like</u> faculty-led group discussions more than their peers ($p = .023$). Students of this type appear to share with Type 4 the orientation towards faculty as the ones who have the facts (the major things to learn). On entry, Type 5 students also significantly disliked independent study more than their peers (homogeneity significant $p = .000$).

Perceived Goals of the Medical School

Type 5 students tend to perceive the goal of "developing administrators" as less valued by the medical school than do their peers. ($p = .080$).

Student-faculty Relations

Type 5 students desire significantly more faculty influence in the educational division of responsibility than their peers ($p = .013$). In contrast to Type 4, they are more clinically oriented, place less value on outside faculty professional activity and want greater structure provided by faculty. Their scores on these dimensions do not differ from the grand means, however.

Except for wanting more faculty influence ($19, p = .083$), these students appear to be reasonably satisfied with student faculty relations as they perceive them.

Elements of Professional Identity

Students belonging to Type 5 are well distinguished from other students by the scales of the PIQ. Their ideal physician is significantly less community oriented ($p = .027$), less psychosocially oriented ($p = .010$), more disease oriented ($p = .023$) and places less value on informing the patient about his diagnosis ($p = .033$). He also tends to place greater importance on his authority in patient care ($p = .080$).

On the career preference clusters, type 5 students score significantly lower on the Primary Care cluster ($p = .020$) and tend to score lower on the Academic-Research cluster ($p = .093$). Their highest scores, on the Referral Specialties and Institutional Practice clusters, are significantly more homogeneous than scores for random samples ($p = .020$ and .017 respectively). On the individual career preference variables,

Type 5's were significantly less inclined towards Internal Medicine ($p = .017$), more inclined towards Dermatology ($p = .037$), less inclined toward the basic medical sciences ($p = .020$) and less inclined towards solo private practice ($p = .040$). They tended to be lower on preference for Obstetrics-Gynecology ($p = .060$) and Epidemiology and Community Medicine ($p = .100$) and higher on Pathology ($p = .073$).

Use of Leisure Time

Compared to their medical student peers, Type 5 students report significantly less leisure time spent in informal outings with friends ($p = .007$), and they tend to report less time spent in individual or solitary activity ($p = .090$).

Summary of Type 5

The major difference between Types 4 and 5 thus appears to be the result of differences on the thinking-feeling dimension. While the Type 4's, with their greater thinking orientation, perform well in traditional kinds of academic tasks (e.g., National Boards) and are attracted to the academic life, Type 5's don't place as much stock in analysis and logic, tend to avoid academic life and to invest themselves in it only to the degree of "getting by." The greater valuation of practical facts in Type 5's seems to be reflected in an even more "tough-minded" image of the physician role than in Type 4's. Their career preferences appear to be toward areas that are not too complex, don't involve a lot of "people-dealing" and are concerned with sensory facts. They might be termed "Introverted Pragmatists."

Type 6

Membership in Type 6 is governed by the following score pattern:

Average Rule-boundness ($\bar{X}_6$ = 47.42)
Moderately High Extraversion ($\bar{X}_6$ = 57.34)
Average Feeling ($\bar{X}_6$ = 47.67)
Average Divergence of Thought ($\bar{X}_6$ = 49.04)
Low Anxiety ($\bar{X}_6$ = 36.39)

The outstanding characteristics of this type are its high extraversion and low anxiety scores. These individuals could be described as outgoing, socially poised, liking to have others around with whom to interact, liking external stimulation and action oriented. While not easily disturbed by self-doubts, nor quickly upset, they may lack the motivation and patience for long, complicated tasks. They tend to be interested in results rather than principles or ideas.

Academic Performance and Ability

Type 6 students distribute themselves, in terms of undergraduate grade point average, in a fashion similar to the total sample. The type mean on MCAT average is the lowest of all types (p = .100) with the Science and Quantitative subtests tending to be lower than those for all students combined (p = .097 and .070 respectively).

In spite of their poor showing on MCAT scales, Type 6 students tend to achieve better than average grades in Clinical Science I (p = .093) and to achieve better than average success ratings for the second year of medical school. (p = .087). Their

performance on Part I of National Boards is not distinguishable (on any of the sections) from the means for the total sample.

Preferred Methods of Teaching/Learning

Upon entry to medical school, Type 6 students tended to like faculty-led group discussions ($p = .083$) and student-led didactic lectures ($p = .057$) more than their fellow students. At the time of questionnaire administration, they tended to like clinical rounds ($p = .083$) and continued to like faculty-led group discussions ($p = .067$) more than their peers. Since all of these involve activity on the part of the student, the findings seem consistent with this group's "action orientation."

Perceived Goals of the Medical School

Compared to other students, Type 6 students perceive the goal of "turning out researchers" to be less important in this medical school ($p = .017$).

Student-faculty Relations

Except for their tendency to place less value on Ideal Student Role behavior ($p = .087$), Type 6 students do not differ much from their peers in their expectations of student and faculty behavior.

When their perceptions are adjusted for levels of expectation, these students see more faculty engaging in socio-emotional role behavior, being efficient teachers, being considerate to patients, emphasizing psychosocial aspects of medicine, emphasizing the use of community agencies and non-medical specialists, engaging in

extracurricular professional pursuits and emphasizing the students' personal development. Only the type mean for emphasis on student personal development and the homogeneity for faculty teaching efficiency, however, achieved acceptable levels of statistical significance ($p = .023$ and $.030$ respectively). Whether this means that Type 6 students feel there is "too much" of these things in the medical school environment or that they are "more than satisfied" with the emphasis given to them is not clear at this point, although the latter interpretation seems the most plausible.

Elements of Professional Identity

Type 6 means on the PIQ showed no significant differences from the grand means. On the Disease Orientation scale, however, they did appear to be concentrated on the low side (homogeneity significant ($p = .007$).

On the Institutional Practice Career Preference cluster, Type 6 tended to score high ($p = .083$) due to their tendency to rate themselves more inclined towards working in a private (but not public) institution ($p = .057$). They rate themselves as significantly more inclined towards Radiology ($p = .003$) and work in an educational setting ($p = .023$). They tend to be more drawn to Internal Medicine ($p = .077$) and Dermatology ($p = .090$) than other students.

Use of Leisure Time

Type 6 students spend significantly more leisure time in structured recreational groups ($p = .047$) than do other medical students. Again this may be related to their preference for action.

Summary of Type 6

In summary, this group might be termed "Complacent Extraverts." While not exceptionally capable intellectually, they earn better than average evaluations in the first two years of medical school, perhaps because of their social outgoingness and desire to participate. They appear to be more satisfied with student-faculty relations than other students. Career inclinations in this group look somewhat diverse, although the hypothesis might be entertained that they prefer settings that provide regular hours and allow them freedom to engage in extra-professional activities.

Type 7

This type of student is dentified by the following score pattern:

Average Rule-boundness ($\bar{X}_7$ = 49.91)
Average Extraversion ($\bar{X}_7$ = 47.40)
Slightly Low Feeling ($\bar{X}_7$ = 45.85)
Average Divergence of Thought ($\bar{X}_7$ = 52.66)
Average Anxiety ($\bar{X}_7$ = 49.57)

In terms of scores on the five personality dimensions and number of members, this type comprises the "average" medical student in this medical school. Compared with college students in general, they are above average in intelligence, emotionally stable and self-assertive (perhaps "dominant" or "aggressive" under certain circumstances). They tend to be critical, experimenting and non-traditional in their views, preferring to make their own decisions rather than rely on group norms.

Interested in art, theory and basic beliefs, they can be quite creative while being immature in practical judgment. Generally, they are of a cheerful nature.

Academic Performance and Ability

The usual pre-entry data are poor predictors of academic performance for Type 7. Their undergraduate grade point averages tend to cover the same range as the combined sample of students and only on the Verbal subtest of the MCAT do they tend to be above average ($p = .080$).

Performance in the first year of medical school and on Part I of National Boards gives a quite different picture of these students. They achieve significantly higher ratings of overall success in the first year ($p = .013$) with significantly better grades in Clinical Science I ($p = .030$) and Medical Biology I ($p = .000$). On National Boards the mean scores for the type are above those for any other type. They are significantly higher on Anatomy ($p = .010$) Physiology ($p = .003$), Biochemistry ($p = .003$), Microbiology ($p = .037$) and Pharmacology ($p = .003$). Their superior academic performance no doubt plays a role in the direction of their career dispositions (see below).

Preferred Methods of Teaching/Learning

Type 7 students tended to like independent study more than did other students on entry to medical school ($p = .083$) and to like faculty led group discussions more at the time of questionnaire administration ($p = .070$).

Perceived Goals of the Medical School

Type 7 did not differ in any significant way from other students in their ratings of medical school objectives.

Student-faculty Relations

Type 7 students desire less faculty accommodation to student needs in teaching sessions (5,p = .033) and less structure in their student roles (8,p = .040) than do other students. In their expectation, they value Ideal Student Role behavior, but only the homogeneity of their scores approaches significance (p = .090).

In terms of perceptions, Type 7 students tend to perceive greater emphasis on student personal development than their peers (p = .090), but this result shrinks to insignificance when their expectations are taken into account, i.e., they both expect more and perceive more of such emphasis in student-faculty relations. For perceptions of faculty socio-emotional role enactment, however, Type 7 students tend to be more satisfied than their peers (p = .090).

Elements of Professional Identity

No trends were found for Type 7 on any of the PIQ dimensions. In fact, their scores were closest to "average" of any of the types.

On the career preference clusters, Type 7 scored significantly higher than average on the Academic (p = .017) and significantly lower on the Surgery (p = .050) clusters. On the individual career preference variables, Type 7 students rate themselves significantly more inclined

than their fellow students towards research (p = .010) and basic medical sciences (p = .000) and significantly less inclined towards Surgery (p = .010), Anesthesiology (p = .050) and group private practice (p = .033). They also tend to dis-prefer Radiology more than their peers (p = .087).

Use of Leisure Time

Type 7 students report spending significantly less time than average in task-oriented groups (p = .023), individual activity (p = .033) and informal outings with friends (p = .017) and tend to report less time spent in structured recreational groups (p = .053) and professional groups (p = .080). Family recreation tends to be somewhat higher than average (p = .100). One wonders if these generally low leisure time estimates represent a reporting or perceptual bias or if these students do, in fact, spend most of their time studying. If the latter, perhaps there is at work some kind of determination to excel which overcomes the only average ability of these students (or, perhaps, the MCAT does not measure relevant abilities).

Summary of Type 7

This group of "average" medical students (in terms of the five personality dimensions) appear to be average only in their image of the ideal physician. They might better be labeled "Ideal Students," at least as far as the criteria of success in the first two years go. They achieve good grades, perform exceptionally well on National Boards,

do not need "structure" in their student roles nor accommodation on the part of faculty. They are more satisfied than their peers with the amount of encouragement and support received from faculty and, one might suspect, they are more likely than other students to get it. Their career perferences reflect their academic success in the basic sciences, it would seem, perhaps with an additional constraint that "technology oriented" specialties receive lower priority.

Type 8

Students are identified as belonging to Type 8 by the following score pattern:

Moderately Low Rule-boundness ($\bar{X}_8$ = 44.42)
Average Extraversion ($\bar{X}_8$ = 47.84)
Average Feeling ($\bar{X}_8$ = 53.71)
Average Divergence of Thought ($\bar{X}_8$ = 50.70)
High Anxiety ($\bar{X}_8$ = 72.97)

The most outstanding characteristic of this profile is, of course, the exceedingly high amount of acknowledged distress. Combined with the tendency toward low Rule-boundness, one would expect these individuals to experience undisciplined and unchanneled self-conflict. Depending upon circumstances, they may be anxious, self-reproaching, worrying or suspicious of the intentions of others. They are prone to guilt feelings and may be easily upset by real or imagined assaults on their identities.[6]

Academic Performance and Ability

The type mean for this group on undergraduate grade point average is fourth highest, but this difference from the grand mean is not

statistically significant. On the MCAT, Type 8 students show the high Quantitative-low Verbal and General Information pattern. However, none of the scales significantly distinguishes Type 8 from the total group.

In the first year of medical school, Type 8 students achieve "satisfactory" grades in Clinical Science I and Medical Biology I (homogeneity for both courses is 1.000) and are rated at the mean in overall success. In the second year, however, they tend to get poorer grades in Clinical Science II ($p = .060$) and Medical Biology II ($p = .083$) and to be rated lower in overall success ($p = .070$). Their scores on all sections of National Boards, Part I, do not differ substantially from the means for all students combined.

Preferred Methods of Teaching/Learning

This type rated independent study as less desirable both at the time of entry to medical school ($p = .087$) and at the time of questionnaire administration ($p = .023$) than did their peers. Student-led group discussions were given lower ratings after being in medical school ($p = .033$) and faculty-led group discussions tended to be more disliked on entry ($p = .087$). Both group discussions and independent study could, conceivably, be anxiety arousing situations for these students: the former might arouse some kind of social anxiety mediated by comparison processes; the latter might arouse anxiety because of lack of structure and the inability of this kind of student to impose it himself.

Perceived Goals of the Medical School

Type 8 students rated the goals of developing researchers ($p = .070$), administrators ($p = .057$) and teachers ($p = .077$) higher than did their peers.

Student-faculty Relations

Type 8 students tend to place more value on faculty professional activity outside of teaching ($p = .077$) and to want greater student influence in the educational process (7, $p = .070$). In other respects, their expectations do not differ much from the total pool of subjects.

When perceptions are considered, students in this type see significantly fewer faculty embodying characteristics of the ideal teacher role ($p = .020$) and tend to see fewer faculty being supportive and helpful (13, $p = .083$). To a significant extent they feel both faculty and students do not engage in enough extracurricular activity (23, $p = .030$).

Elements of Professional Identity

Type 8 students are significantly more "disease oriented" than other students ($p = .007$) and more inclined to let the nurse (rather than the physician) handle matters of information exchange with patients (25, $p = .047$). Both of these findings suggest that, if possible, these students would like to avoid situations in medical care that are likely to arouse anxiety.

On the career preference clusters, Type 8 is radically low on the Primary Care cluster (p = .000) and the highest of all types on the Referral Specialties cluster (not significant). On the Individual Career Preference variables, they are significantly less inclined than their peers towards Obstetrics-Gynecology (p = .000), Epidemiology and Community Medicine (p = .043), Pediatrics (p = .017) and Internal Medicine (p = .000). They tend also to be disinclined towards Family or General Practice (p = .080), Anesthesiology (p = .080), and Pathology (p = .057). Their preferences are towards Ophthalmology (p = .033) and Otorhinolaryngology (p = .017).

Use of Leisure Time

Students belonging to this type spend significantly less time in structured recreational groups (p = .000) and individual or solitary activity (p = .030) and tend to use more of their leisure in informal outings with friends (p = .057) than other students. This is interesting in light of their dissatisfaction with the amount of extracurricular activity reported on the SFRQ. Perhaps they seek out others in informal settings in an attempt to get reassurance or to temporarily be distracted from their worries. In any event, being alone or working alone (as in independent study) does not seem to appeal to them.

Summary of Type 8

As far as can be determined from the predicted variables, Type 8 appears to be composed of "Anxious Avoiders." That is, their tendencies

toward unfavorable self-characterizations are easily elicited by a number of situations and they wish to avoid them. In school, loneliness or anxiety aroused by not being able to organize oneself might be submerged by frequent outings or involvement in extracurricular activities (although this strategy might take its toll on academic performance). Type 8 students seem to project their anxiety on faculty, seeing them as not being orderly, well-organized, interesting as teachers nor supportive and helpful as individuals. They prefer to deal with "disease" rather than the messy problems of interpersonal relations. In their career preferences, Type 8 students anxiously avoid all primary care areas while focusing on highly circumscribed practice specialties.

Type 9

Students are defined as belonging to Type 9 if they have the following kind of score pattern on the five personality dimensions:

Average Rule-boundness ($\bar{X}_9$ = 53.24)
Average Extraversion ($\bar{X}_9$ - 52.67)
Moderately High Feeling ($\bar{X}_9$ = 57.25)
Moderately High Divergence of Thought ($\bar{X}_9$ = 57.70)
Low Anxiety ($\bar{X}_9$ = 41.76)

Individuals with this kind of profile are likely to be seen as warm, sensitive and sympathetic. They are concerned with people's feelings and are tactful, sometimes to the extent of avoiding expression of harsh realities when it is needed. They like the approval of others

and tend to conform, within reason, to group norms. The Type 9 person may become quite enthusiastic about people he admires and may idealize them. Their high self-confidence, when combined with enthusiasm about a person or idea, may lead them to jump into things without sufficient consideration. In general, however, they are conscientious in their work and clever at finding solutions to problems.[7]

Academic Performance and Ability

The mean undergraduate grade point average for Type 9 is above the grand mean but not significantly so. MCAT scores for individuals in this type are likely to be impressive. Type 9 means are significantly higher than average for the Verbal subtest ($p = .003$), the Quantitative subtest ($p = .030$), the General Information subtest ($p = .020$) and MCAT Average ($p = .037$). The Science subtest mean is insignificantly below the grand mean.

Type 9 students only partially live up to the expectations of them created by their MCAT performance. In the first year of medical school, they attain significantly poorer grades in Clinical Science I ($p = .003$). However, this slow start is overcome by the second year when they achieve significantly better grades than their peers in Clinical Science II ($p = .000$) and Medical Biology II ($p = .027$). On Part I of National Boards, their performance is indistinguishable from that of the total student pool except for covering a smaller range of scores on several of the sections. Since very low anxiety scores

are frequently associated with a lack of motivation to persist at difficult tasks, one might hypothesize that these students are satisfied with "getting by" National Boards rather than excelling on them as they probably would be able to do judging from their MCAT scores.

Preferred Methods of Teaching/Learning

On entry to medical school, Type 9 students recall disliking student-led didactic lectures ($p = .040$) and tutorials ($p = .077$) to a greater extent than their peers. They showed more liking than other students for student-led group discussions both on entry ($p = .097$) and at the time of questionnaire administration ($p = .013$). Face-to-face interaction with peers is something enjoyable to them as one would expect from their high Feeling scores.

Perceived Goals of the Medical School

Type 9 students tend to rate the goals of "developing clinicians" and "developing teachers" higher than do other students ($p = .057$ and .093 respectively). Since both of these involve a lot of face-to-face interaction, one wonders if they are not enthusiastically projecting their own wishes on the medical school. A view of faculty as "benevolent" would seem to be required and is supported by their SFRQ responses.

Student-faculty Relations

Students in this group desire and value student enthusiasm and involvement more than other students (1, $p = .040$) and place greater

relative value on academic (as opposed to clinical) performance ($p = .047$). They tend to want faculty to provide more structure in the sense of specifying requirements, giving feedback, evaluating by regular tests, encouraging questions and discussion, etc. (8, $p = .080$).

They perceive a significantly greater proportion of faculty as effective, efficient, "ideal" teachers (9, $p = .040$) and generally view student-faculty relations in a favorable light even when scores are corrected for level of expectations (although none of the differences from the grand means are statistically significant).

Elements of Professional Identity

On the PIQ, Type 9 students tend to place more value on the physician being able to create a warm, empathic relationship with patients (27, $p = .087$). This is in keeping with their "feeling" orientation. They also tend to give the nurse greater relative responsibility for housekeeping matters than their peers (28, $p = .087$).

On the career preference clusters, Type 9 is significantly more oriented to primary care than other students ($p = .017$). They rate themselves significantly more inclined towards Obstetrics-Gynecology as a specialty choice ($p = .000$) and tend to be more inclined towards Epidemiology and Community Medicine ($p = .053$), Pathology ($p = .063$), and work in a public institution ($p = .090$). They are significantly more disinclined towards Dermatology ($p = .007$) and tend to be more disinclined towards basic medical sciences ($p = .057$), group private practice ($p = .053$) and work in a private institution ($p = .070$).

Use of Leisure Time

Type 9 students tend to spend more time in task-oriented groups ($p = .093$), less time in structured recreational groups ($p = .097$), and less time in family recreation ($p = .053$) than their peers. One might suspect their tendency to be enthusiastic about "causes" and perhaps some social service orientation (see, for example, their preferences toward work in public institutions but away from private institutions) may account for the first named trend.

Summary of Type 9

In summary, Type 9 students might be characterized as "People-Oriented Enthusiasts." They value enthusiasm in students and view faculty in a favorable light. Although they are high ability individuals, they do not seem motivated to put their abilities to work in the basic sciences. Warm and sensitive interpersonal relations are their forte. Type 9s are attracted to the primary care specialties and, perhaps, settings which provide opportunities for social service.

Type 10

This type includes individuals with the following kind of personality profile:

Average Rule-boundness ($\bar{X}_{10} = 53.10$)
Moderately High Extraversion ($\bar{X}_{10} = 55.34$)
High Feeling ($\bar{X}_{10} = 61.92$)
Low Divergence of Thought ($\bar{X}_{10} = 35.14$)
Average Anxiety ($\bar{X}_{10} = 50.77$)

Like Type 9, this type is primarily concerned with people, but in a more practical, materialistic way (as opposed to being interested

in their "inner life" and potentialities). This kind of person is friendly, warm, talkative, and cooperative in groups. He tends to be conscientious and orderly in his work and adapts well to routine. He has little capacity for abstract or novel thinking and thus may have trouble when things get complicated or require "inspiration." However, he can work diligently to master facts and details.

Academic Performance and Ability

Mean undergraduate grade point average for this type was not significantly different from the grand mean. On the MCAT their best scores were on the Quantitative subtest although the Type 10 mean did not differ significantly from that for all students combined. They scored significantly lower than average on the Verbal subtest ($p = .030$).

During the first year of medical school these students achieved significantly better grades in Clinical Science I ($p = .023$), but tended to be graded lower than other students in Medical Biology I ($p = .067$). On National Boards, Part I, Type 10 attained significantly lower scores on the Pharmacology section ($p = .047$) but did not differ significantly from average for the remaining sections. They do not seem to be outstanding academic performers except where their extraversion and interest in people can work for them.

Preferred Methods of Teaching/Learning

Type 10 students liked student-led didactic lectures ($p = .027$) and student-led group discussions ($p = .053$) more than their fellow students when they entered medical school. Here again, the people and action orientation of the "extraverted feeler" seems to be playing a role.

Perceived Goals of the Medical School

Type 10 students gave significantly lower ratings to the goals of "developing clinicians" ($p = .020$) and developing researchers ($p = .000$) than their peers and were more homogeneous in their lower ratings of the goal of "developing administrators" ($p = .033$).

Student-faculty Relations

Less value tends to be placed on faculty structuring of educational tasks by students in this group in comparison with the total sample (8, $p = .083$). Generally, their scores indicate they place less value on most of the characteristics measured by the SFRQ-1 than do other students (except for Faculty Professional Activity), although these differences are not significant statistically.

They perceive more faculty members as respectful towards patients in terms of both uncorrected (12, $p = .050$) and corrected (22, $p = .037$) perception scores. They experience significantly less satisfaction with the Community Emphasis in the curriculum than other students (20, $p = .030$). The only other area where Type 10 students may have a greater than average discrepancy between expectations and perceived enactments is Involvement in Extracurricular Affairs where the type tends to be more homogeneous in their low scores ($p = .053$).

Elements of Professional Identity

On the PIQ Type 10 students give the nurse significantly more responsibility for exchanging information with patients ($p = .000$)

and tend to give her greater responsibility in housekeeping matters ($p = .070$). They tend not to like playing the Psychological Healer Role with patients ($p = .073$). Using community agencies and allied health personnel, establishing empathy and rapport with patients, and having a psychosocial orientation are also relatively devalued, but the differences from average are not significant. The overall PIQ profile for Type 10 suggests a kind of superficial (though, no doubt, friendly) relationship with patients.

Type 10 has the highest mean score on the Primary Care career preference cluster of all types but this is of marginal statistical significance ($p = .063$). On the individual career preference variables they are significantly higher on Family and General Practice (.017), Epidemiology/Community Medicine/Public Health ($p = .007$) and Group Private Practice ($p = .000$). They dis-prefer working in educational settings more than other students ($p = .030$).

Use of Leisure Time

Type 10 students spend significantly more time in task-oriented group leisure ($p = .037$), significantly less time in professional groups ($p = .047$) and tend to spend more time in structured recreational groups ($p = .097$) than their peers.

Summary of Type 10

The definition of Type 10 students is not as clear as in some of the other types. One gets the impression from their PIQ scores, career preference ratings and use of leisure time, that these

individuals have in mind becoming "Figures in the Community" with plenty of social contacts and "surface" relationships of a pleasant nature. A career in medicine may only be a vehicle for these aspirations since they don't appear to want to assume roles which are presumably important to patient care (even though they score high on primary care specialties) and they are not as involved in professional groups as one would expect from extraverted, people-oriented individuals.

Type 11

The following pattern of personality scores is used to identify students belonging to Type 11:

Moderately High Rule-boundness ($\bar{X}_{11}$ = 57.30)
High Extraversion ($\bar{X}_{11}$ = 63.51)
Moderately Low Feeling ($\bar{X}_{11}$ = 43.73)
Moderately High Divergence of Thought ($\bar{X}_{11}$ = 57.43)
Average Anxiety ($\bar{X}_{11}$ = 46.13)

Individuals of this sort enjoy being in the "driver's seat" in an organization, i.e., making decisions and giving orders. They value reason and what they consider to be "efficiency" (clearly defined objectives, well-thought-out plans, systematic work, order, scheduling). These characteristics are, of course, an asset in situations that can be routinized and require productivity (in terms of quantity).

Type 11s control their own behavior by adherence to socially-approved, often traditional standards and are likely to pride themselves on being responsible. While this kind of person is

very outgoing and socially oriented, his biggest problems may occur in that realm. This is because he is naturally critical and tends to impose his own values for order and reason on others. If the other does not hold the same values, or defines them differently in some context, the Type 11 may "rub him the wrong way." Additionally, the Type 11 has a hard time inhibiting his judgmental process long enough to listen to others and get enough information to make sound decisions. These students, on the other hand, are interested in new ideas and complex problems and may see long-range possibilities in them.[8]

Academic Performance and Ability

The Type 11 mean undergraduate grade point average is insignificantly higher than the grand mean, although the within type homogeneity tends to be greater than average ($p = .080$). Mean MCAT scores for the type are below average for all subtests except the Verbal, but these differences are not statistically significant.

In medical school, students in this type received significantly poorer grades in Clinical Science I ($p = .050$) but significantly better grades in Medical Biology II ($p = .020$). National Boards, Part I, scores were very similar to mean scores for all students combined.

Preferred Methods of Teaching/Learning

On entry to medical school, students belonging to Type 11 preferred independent study more than their peers ($p = .057$).

This could be a result of their desire to organize, schedule, and systematize their work in their own way and to their own standards.

Perceived Goals of the Medical School

Type 11 students see "developing researchers" as a lower priority goal of the medical school than their peers ($p = .053$).

Student-faculty Relations

In keeping with their "Rule-bound" nature, Type 11 students place greater value on student enthusiasm and interest, order and productivity, and consideration towards faculty (1, $p = .017$). They tend to devalue the importance of informal contacts with faculty members (keeping an "appropriate" distance?) (6, $p = .087$).

They are more critical than other students in their assessments of the amount of psychosocial emphasis in the curriculum (11, $p = .047$), a fact which tends to hold up when corrected for their level of expectation (18, $p = .057$). They are also less satisfied than other students in the amount of student and faculty involvement in extracurricular affairs (23, $p = .010$).

Elements of Professional Identity

On the PIQ, Type 11 students placed greater importance than their peers on the physician fully informing patients about their disorders ($p = .000$), tended to place greater value on the use of community agencies and allied health personnel (31, $p = .077$) and tended to favor a "Disease Orientation" ($p = .083$).

These students tend to score higher than others on the Institutional Practice Career cluster ($p = .057$) due to significantly higher scores on the "Private Institution" variable ($p = .020$). They express a greater than average preference for Psychiatry as a specialty choice ($p = .050$) and Group Private Practice as a work setting ($p = .017$). Their scores on Obstetrics-Gynecology tend to be higher than average ($p = .080$) while their scores for Basic Medical Sciences tend to be lower than average ($p = .070$). Depending upon the approach taken, all of these situations allow latitude for a "Managerial" role set, e.g., one can manage (rather than treat) psychiatric patients, especially in an institution, and one can give orders to and direct expectant mothers.

Use of Leisure Time

Type 11 students tend to report using more of their leisure time in structured recreational activities than do their peers ($p = .080$). Perhaps even their recreation is approached with order and efficiency in mind.

Summary of Type 11

In terms of their personality characteristics, individuals in this type appear to be the "Managers," i.e., they like to organize activities and direct people. It might seem that the predicted variables do not present a totally coherent picture, however. On the other hand, Type 11 students score in directions indicating humanistic trends: they desire more psychosocial emphasis, favor use of community resources

in medical care, believe it important to inform patients about their disorders and are inclined towards Psychiatry. On the other hand, they score on some variables in a direction indicating a certain "distancing" from others: they tend to be disease oriented and don't value informal relationships with faculty. As with the personality dimensions, perhaps it is not so much the values attained on the individual variables but the pattern of characteristics which is important. That is, what appear to be divergent trends might be reconciled by assuming that Type 11 students operate according to a definite set of rules in their interpersonal relationships, that what appear to be "tender-minded" characteristics, in reality, come under the rubric of "order and efficiency" for these individuals. This interpretation is consonant with the meaning attached to elevated Rule-boundness scores.

Type 12

Students are indentified as fitting into Type 12 by their similarity to the following personality profile:

High Rule-boundness ($\bar{X}_{12}$ = 63.01)
High Extraversion ($\bar{X}_{12}$ = 59.39)
Average Feeling ($\bar{X}_{12}$ = 48.48)
Low Divergence of Thought ($\bar{X}_{12}$ = 37.04)
Low Anxiety ($\bar{X}_{12}$ = 42.27)

This type bears some resemblance to Type 11 in terms of being socially outgoing and bound by socially acceptable codes of conduct. They differ in being less analytical, more factually minded and

oriented to practical affairs and having a much lower level of anxiety. This last characteristic may indicate low motivation for persisting at difficult tasks, perhaps a kind of "over-satisfaction" with themselves. The Type 12 person is intellectually not very curious, nor is he an inspired thinker. His forte seems to be in the systematic organization of facts and operations that are fairly concrete in nature.[9]

Academic Performance and Ability

The mean undergraduate grade point average for Type 12 is the lowest of all types, although it is not significantly differerent from the grand mean. Their MCAT scores have the high Quantitative peak, but tend to be low on the Verbal subtest ($p = .053$).

They achieve significantly better grades in Clinical Science I ($p = .007$), but significantly poorer grades in Medical Biology II ($p = .030$) than do other medical students. Type 12 students perform the weakest of all types on National Boards, Part I. They are significantly lower on the Physiology section ($p = .007$), the Biochemistry section ($p = .010$), the Microbiology section ($p = .003$) and the Pharmacology section ($p = .007$). They tend also to be lower on the Anatomy section ($p = .060$).

Preferred Methods of Teaching/Learning

Students in this type, more than other students, definitely appear to want information "poured" into them in didactic style.

On entry to medical school, they rated student-led didactic lectures higher than their peers ($p = .010$), and at the time of questionnaire administration, they rated both student-led ($p = .093$) and faculty led ($p = .033$) didactic lectures more favorably. They showed a greater than average dislike for faculty-led group discussions ($p = .057$ and $.017$) and clinical rounds and conferences ($p = .020$ and $.033$) both on entry and at the time data was collected.

Perceived Goals of the Medical School

No significant differences from the total group means or trends were found for Type 12 students in their perceptions of medical school goals.

Student-faculty Relations

As with other types having high Rule-boundness scores, Type 12 students place greater importance on students enacting Ideal Student Role Behavior ($p = .003$). They also place greater emphasis on developing students' Psychosociocultural Sensitivity ($p = .050$), want more informal contacts with faculty ($6, p = .013$) and tend to want more structure in the educational setting ($p = .060$).

They perceive more Psychosocial Emphasis in the curriculum ($p = .033$) and tend to see greater emphasis on Student Personal Development ($p = .073$) than other students. Compared to expectations, however, they tend to see greater than average deficiency only in faculty support, encouragement and helpfulness ($17, p = .097$). Thus, these students appear to be fairly content with student-faculty relations.

Elements of Professional Identity

Type 12 students differ from the norm in placing significantly more importance on the physician's authority ($p = .027$), tending to devalue the importance of the patients' knowledge of his disorder ($p = .080$) and being more homogeneous in their "disease oriented" approach ($p = .087$).

On the career preference clusters, this type was significantly lower than their peers on the Research-academic cluster ($p = .013$). They tended to be lower on the Referral Specialties cluster ($p = .077$) and the Institutional Practice cluster ($p = .053$) and higher on the Surgical Specialties cluster ($p = .080$). On the individual career preference variables, Type 12 students' means were significantly higher than average on Family and General Practice ($p = .043$) and lower than average on Ophthalmology ($p = .013$), Otorhinolaryngology ($p = .047$), Research ($p = .003$), Education ($p = .007$) and work in Public Institutions ($p = .033$). Trends toward Surgery ($p = .063$) and away from Epidemiology/Community Medicine/Public Health ($p = .053$) and Dermatology ($p = .093$) were also found.

Use of Leisure Time

Students in this type report using significantly more leisure time in Task-oriented Groups ($p = .030$), more leisure time in Professional Groups ($p = .000$) and more leisure time in Family Recreation ($p = .017$) than their peers. All of these are quite "traditional" uses of leisure and thus might be related to the high Rule-boundness scores of the type.

Summary of Type 12

In summary, Type 12 students might be identified with the label "Extraverted Pragmatists." They lack the motivation to do very well on National Boards, Part I, prefer the traditional lecture method of teaching, want faculty to provide structure and think students should be enthusiastic, productive and considerate to faculty. They are generally content with medical school, except for the amount of encouragement and support they perceive themselves to receive from faculty. They seem to be "traditional" also in their view of the physician role, in their career preferences and in their uses of leisure time. The impression one receives from the data is that Type 12 students would like to step into the stereotyped physician role.

COMPARISONS WITH PREVIOUS MEDICAL STUDENT TYPOLOGIES

Because of differences in scoring techniques, criteria used, time periods of prediction, methods of identifying types, etc., it is impossible to make very rigorous comparisons and contrasts between the typology developed in this study and the other typologies which have been proposed for medical students. Nevertheless, it may be instructive to juxtapose the various schemes in order to see if any gross similarities appear.

In terms of the basic measurement dimensions, the 16 category scheme of Isabel Briggs Myers is most similar to the present one. Each of her types is identified by a combination of four indices: a preference for sensation (S) or intuition (N), a preference for

thinking (T) or feeling (F), a preference for introversion (I) or extraversion (E), an attitude which is either judging (J) or perceptive (P). In her study of medical students,[10] she found certain of these preferences were over or under-represented when compared to a college-bound high school sample. The percentage breakdown of the preferences for these two groups as well as for the sample used in the present study appear in Table 2. Based on the high school frequencies, both medical student groups are over-represented in the introversion, intuitive and feeling preferences. Mrs. Myers explains these findings in terms of the notion that medicine offers a field in which an individual may be humanitarian (thus, the appeal to feeling) and/or scientific (allowing more intuitive persons to problem solve and the introvert to concentrate on intellectual matters). The UNM sample looks quite similar to the earlier medical group except that it includes intuitives.

When preferences were broken down into the 16 possible categories, Mrs. Myers found the most over-representation in the INFP group, followed by INFJ, INTP, ENFJ, INTJ, ISFP, ISTP, ENFP and ISFJ. The ESTJ was most under-represented in the medical student group followed by ISTJ, ESTP and ENTJ. These findings were based on the ratio of medical school relative frequency/academic high school relative frequency. Since it was not possible to compute these ratios for the UNM sample, their distribution in the Myers type categories (scored by her method) were viewed simply in terms of percentages (see Table 3). It can be seen that over-representation of INFPs, INTPs, ENFPs and perhaps INTJs is confirmed

TABLE 2

Frequency of Myers-Briggs Preferences Among High School Boys, Medical Students, and the University of New Mexico Sample of Medical Students

	N	E	I	S	N	T	F	J	P
HIGH SCHOOL	3503	62%	38%	58%	42%	62%	38%	51%	49%
MEDICAL SCHOOL	4622	50%	50%	47%	53%	53%	47%	43%	57%
UNM	146	47%	53%	34%	66%	56%	44%	51%	49%

TABLE 3

Percentages of the UNM Medical Student Sample Falling Into Each of the Myers-Briggs Types

ISTJ	ISFJ	INFJ	INTJ
7.5%	3.4%	1.4%	10.3%
ISTP	**ISFP**	**INFP**	**INTP**
4.1%	3.4%	14.4%	8.9%
ESTP	**ESFP**	**ENFP**	**ENTP**
1.4%	2.1%	8.9%	6.3%
ESTJ	**ESFJ**	**ENFJ**	**ENTJ**
8.2%	3.4%	6.8%	10.2%

in this sample. The over-representation of INFJs is not, however, and neither is the under-representation of ESTJs, ISTJs and ENTJs. Whether these differences are due to the small UNM sample, to generational differences (the Myers' sample was from classes entering medical school nearly two decades ago), to differences in admissions procedures or to changes in the "image" of medicine over the years, is hard to say.

Switching now to a comparison of the 12 types derived in the present study with the 16 traditional Myers-Briggs' categories, it should first be noted that, in addition to including another dimension of individual variation, scores were obtained in a different manner[11] and standardized for the sample of medical students. This involves a shifting of reference axes for those dimensions that correspond in the two schemes. Thus, an individual who is an INFP according to the Myers-Briggs' scheme may fall into the "average" category in the typology of this study because scores are on a continuum and have been "recalibrated" for the group by itself.

If the anxiety dimension is ignored and mean type scores above 50 and below 50 allowed to represent Myers-Briggs' preferences, then the typology developed in the present study shows correspondences to 10 of the Myers-Briggs' types. Two of the corresponding Myers-Briggs' types are each divided into two subtypes by the analyses of this study. Those types which seem to be "absent" are ISFJ, INFJ, INTJ, ISTP, INTP, ESFP. Since the INTJ and INTP categories were both sufficiently populated when scored by Myers' method, it can be

assumed that their "absence" reflects a change in the "center of gravity" of the type table -- toward the introverted-intuitive corner. The other four absent types were sparcely populated even when scored in the traditional manner.

Remembering that the correspondences between the two typological schemes are only approximate, the specialty ratings of the UNM sample can be compared to the actual specialties chosen by subjects in the Myers' sample. Both the ESTJ group and Type 12 students seemed to prefer general practice and surgery and dis-prefer academic and research careers. Type 10 students were "in line" with the preference shown by the ESFJs for general practice and dis-preference for medical education. However, Type 3 and the ENFP group differed in their preferences for Pediatrics, General Practice and Anesthesiology. Most of the remaining pairs of types showed more disagreement than agreement in their specialty preferences.

These differences may represent simply the differences in the typologies, the differences in what was predicted (a specialty rating while in school vs. actual choice of specialty 12 years later), or differences in the institutions from which subjects were drawn. However, it is also possible that the differences represent changes in the character of specialties in the last 20 years and differences in what is "in" in terms of popularity. Perhaps those students who, in the past, would have chosen Psychiatry would now choose one of the primary care areas. It is interesting that all of the types

in the present study which rated Primary Care specialties as preferred with extraverted-feeling types (with the exception of Type 12). In the Myers' study, these types, when intuitive, tended to be over-represented in Psychiatry. The different choices both "make sense" in terms of the characteristics imputed to the type if one makes allowances for changes in the "images" of the two specialities.

Although not truly a typology, the two dimensional scheme of Davies and Mowbray[12] at the University of Melbourne is of interest because their dimensions appear to be similar to two of those used in the present study. They divided subjects into four quadrants on the basis of scores on a thinking introversion scale and a complexity of thought scale. Subjects in the extraverted-low complexity of thought quadrant most preferred Surgery as a specialty, were uninterested in Psychiatry, saw income as the most important factor in career satisfaction, reported their decision to enter medicine was influenced by their families and had no serious doubts about that decision. This sounds most reminiscent of the Type 12 students in the present study.

The extraverted-high complexity of thought subjects preferred General Practice as well as Surgery and saw the most important factor in Career Satisfaction to be the gratitude of patients. These characteristics are similar to those found in Types 3 and 9. Subjects in the introverted-high complexity of thought quadrant were specially

interested in Psychiatry, but also in Internal Medicine and General Practice. Introverts, in general, achieved higher marks on a multiple choice Psychiatry examination and in their aggregate marks for Surgery, Obstetrics-Gynecology and Medicine. Of those who were interested in research, half were in the introverted-high complexity of thought quadrant.

These results appear to be in line with the findings of the present study insofar as the dimensions are comparable.

Funkenstein[13] has postulated three broad types of medical students: the student scientists, the psychologically-minded students and the student practioners. The student scientists have an undergraduate background in science and mathematics, have higher Quantitative and Science than verbal MCAT scores, have vocational interests similar to those of natural scientists and lack experience in dealing with people. While successful and content during the preclinical years of medical school, they may have problems in the clinical years, apparently due to difficulties in working with people and being required to take action without complete evidence. Their career interests are teaching and research. These specifications seem to fit amazingly well students belonging to Type 4 (Biological-academics) in the scheme proposed in the present study.

The psychologically-minded students, according to Funkenstein, have an undergraduate background in the humanities, have very high Verbal MCAT scores but relatively low Quantitative scores and have

vocational interests in the verbal-linguistics group. They have skill and experience in working with people and lean towards careers in Psychiatry. The first two years of medical school are difficult for them because they do not see the relevance of basic medical sciences to their future careers. In the clinical years, however, they are likely to "shine" due to their interest and ability in working with people. All in all, Type 1 (Disillusioned Idealists) students appear most similar to the psychologically-minded group, in spite of the fact that their interest in Psychiatry is no greater than average. Their MCAT pattern, attitudes toward physician roles and disillusionment with the first two years of medical school are all in line with the characterization presented by Funkenstein. The lack of interest in Psychiatry may simply reflect differences in the image of this specialty presented at Harvard and UNM or in the zeitgeist of medicine.

The student practitioners are said to have few intellectual interests, to have majored as undergraduates in "extracurricular activities" and to have vocational interests similar to individuals in the service occupations. Their MCAT scores are not outstanding in either verbal or science-quantitative areas. Their interests are in people, and they want to practice medicine in such a way that their interests can be realized. Thus, they are presumed to have difficulty with the basic sciences, but do well in the clinical years except, perhaps, for Psychiatry since they are not very introspective. The typology developed in the present study presents several

candidates for this group: Type 3 (People-oriented), Type 6 (Complacent Extraverts), Type 9 (People-oriented Enthusiasts), Type 10 (Figures in the Community) and Type 12 (Extraverted Pragmatists). Three of these can be eliminated on the basis of MCAT scores, expectations and perceptions of medical school, and attitudes expressed in their physician ideologies. This leaves Types 10 and 12 as reasonable approximations to the kinds of students Funkenstein describes. Obviously, this is a much more heterogeneous group than the other two and much harder to identify unequivocally using Funkenstein's criteria.

The final typological scheme to be described is the one proposed by Beiser and Allender.[14] Their types were formulated and described in terms of answers to a questionnaire which included biographical items, future wishes and a "philosphy of life" essay. The "striver" type evidenced few nonacademic interests and lacked an intensity of interest even in academic subjects. They tended to be youngest sons from families of recent Americanization who were not mobile and of low socioeconomic and educational status. In spite of this, the parents were the major source of financial support. In interviews, they seemed practical, family oriented and desirous of security and personal happiness. Using the criteria of grades and MCAT scores, they were identified as "over-achievers" in medical school. They seemed to prefer to go into General Practice.

The "individualist" was described as having strong but equal motivation for scientific pursuits and working with people. These

students tended to be the oldest sons of upwardly mobile, higher social status parents. In interviews, they appeared "aggressive" and definite," wanted large families and to live in small towns. This group was also identified as "over-achievers" in medical school and presumably showed an uneven pattern of achievement based on their interests. The authors described them as "not eager to impress people," and "strong-willed."

The "unrealist" type was identified by errors in marking on the questionnaire or marking "don't know" on any item of basic family or personal information. They were said to come from unstable families where the mother's education was greater than that of the father, to have broad and deep non-academic interests, to have minimal premedical education and to show more interest in English than the average medical student. They were deemed "under-achievers" in medical school but also "likeable," "bright," "optimistic" and having a "childlike faith." The term "unrealist" was applied because, it seemed to the authors, they failed to see some elements in their environment.

Because of the catch-all nature of things used to define these types, the vagueness of characteristics, and lack of measurement, it is doubtful whether this scheme should even be called a typology. The difficulty of identifying members is evident in the fact that only 55 out of 200 students in the class could be classified into one of the three groups. Considering the fuzziness of Beisers' scheme, it is not surprising that one should have difficulty in

finding any correspondences with the types developed in the present study. Perhaps there is some similarity between Type 1 and the "individualist" although one has little confidence in this.

Viewed as a whole, there appear to be some similarities between some of the types identified in this study and some of the types proposed previously. The present typology of medical students has the virtues of being relatively unequivocal in assigning members to types, in being relatively all-inclusive (i.e., encompassing most students) and in maximizing within sample differences. The fact that it predicts a relatively large number of "external," medically-relevant variables is the best measure of its value.

LIMITATIONS AND UNRESOLVED PROBLEMS

The several clusters of students which emerged in this study were found to possess medicine and medical school related characteristics which could be construed as "making sense" in terms of their personality descriptions. However, a number of limitations exist due to less than optimal sampling conditions, data collection periods, sample size and so on.

Potentially, the most serious problems would seem to be introduced by the use of cross-sectional rather than longitudinal data. This was necessary at the time the study was initiated in order to obtain enough subjects for application of the analytic procedures. But it is now known (from data not reported here) that many of the measures show change as a function of duration in medical school.

Several of the SFRQ variables, for example, reveal increasing or decreasing trends over the four years of medical school. What the cross-sectional sample does, then, is to confound two sources of variation in some of the dependent variables: that due to individual differences and that due to year in medical school. If the independent variables, the types, were also related to year in medical school, then one might be concerned that some of the findings could be artifactual. Since type membership showed no more than chance relationships to year in medical school in this study, however, one might suppose that the confounding of these two sources of variance did no more than increase "error" variance. That is, some "true" relationships were probably not identified because of inflated within-type variance due to the mixing of students in different years within the same type.

The small number of subjects in each type also presents problems in generalizing the results. Although this is taken into account in calculating probability levels, one still may question the reliability of such findings, especially when shrinkage due to missing data occurs for a type having a small n to begin with. The shrinkage itself might be biased so that otherwise random influences could determine whether or not a characteristic is significantly related to a type.

Another set of problems relates to the stability of the types themselves. Part of this problem has to do with whether or not the same types with the same "boundaries" would appear if additional subjects were added to the pool. Would the "spaces" between presently

identified types "fill up" so that some of these types would merge? Would the densities of modal points shift from their present locations in k-dimensional space? Would new modal points or clusters segregate out so that two or more types exist where there was only one? The answers to these questions are all dependent upon the representativeness of the initial sample. The larger the N, of course, the more stable one would expect type boundaries and means to become. This is an empirical problem for which, at present, there is no solution. As data accumulates, it will be possible to assess how much type configurations, inter-type similarities and the existence of types is dependent upon sample size.

Another part of the problem of type stability has to do with whether or not the same individuals would be grouped together at time T_2 as at time T_1. That is, would the typological procedures identify the same cohorts of subjects if the assessment devices were readministered at a later date? This is, of course, dependent upon the reliability of scores with which individuals are located in k-dimensional space. Test-retest correlations for the variables used in the present study indicate reliabilities, after one year, which approaches the maximum for tests of this sort.[15] Whether or not this is "reliable enough" is another question. It is conceivable that minor changes in all subjects on all dimensions might produce a quite different alignment of subjects. The problem is compounded further by the fact that observed changes in test scores are composed of both "real changes" in the problem-solving systems being assessed and changes due simply to the unreliability of the

test itself. Preliminary data suggests that, on some of the personality variables, changes in scores reflect mainly test unreliability, while on other variables both influences seem to play a part.

Assuming the problems of test unreliability can somehow be overcome or at least "lived with," one is still faced with the implications of real change for any typological scheme. One can imagine four kinds of outcomes, depending upon the nature of score changes in the sample. In the first case, whatever the influence or influences that produce the change, all subjects are affected equally so that the coordinates, in terms of raw scores, are displaced from their original positions. Since, in psychological measurement, most scores are standardized anyway, the net result of such changes would be no change in the distribution of points in measurement space.

A second possible outcome might be that the means and/or variances of the types change without changing the assignees to the types. Thus, the members of a type might be more or less "spread out" in comparison to a prior analysis, or their "center of gravity" might shift in the measurement space. These changes would present no major conceptual problems, although the structure of relationships between types might change.

A third possibility is that the structure and locus of types remain much the same from one analysis to another, but that individuals change their category assignments. The analogy one thinks of here is of a set of job categories within an organization with, for example,

promotional shifts taking place. If this kind of situation should obtain, the problem then becomes one of identifying the rules of change in type assignments.

Finally, it would be possible for the number, definitions and interrelations of types to change drastically from one time period to another. That is, new groupings of subjects with different loci in the score space might emerge. Such an outcome would not necessarily mean that one should abandon the notion of types, although a revision in the way one thinks of them would possibly be required. Thus, they would have to be recognized as relatively temporary "states" of an array of objects and their associated attribute values, rather than clusters of objects which are stable over time. And a new set of empirical problems would be generated, namely, the identification of regularities in, and determinants of, transitions from state to state. An example of an area where this kind of structural change might occur is in a developing organization where roles are being progressively differentiated. At an early stage there could be just a few relatively heterogeneous groupings, while later stages might see more homogeneous subgroups become segregated out, i.e., certain individuals would become more similar to each other and more dissimilar from others.

Any one or a combination of these outcomes is conceivable within the conceptual framework of this study. Problem solving systems are seen as dynamic structures capable of modification at a number of levels. However, it is hypothesized that the amount

of real change which takes place in the characteristics used to define system types in the present study will be relatively small over the developmental period of interest. Except for the difficulties introduced by measurement error and sampling bias, then, one would expect more or less the same types to emerge at different time periods. Further research should be able to identify the degree to which this is so and the amount of attention which must be directed to experiential changes in these system characteristics.

A problem left unresolved by the present research has to do with the choice of dimensions on which to base a typology. One can still ask what would have been the results if additional dimensions had been included or if alternative dimensions had been substituted. Would the predictive utility of the resulting types have been increased? Would the types have had greater heuristic value? The major constraints on how this problem is handled seem to be practical ones. With the number of subjects small relative to the number of dimensions, it is possible for the k-dimensional score space to be so sparsely populated that modal points would be unreliable and the types would be of low homogeneity. And, even if a large number of subjects were available, it would be difficult to induce them to take a huge battery of assessment devices.

In any given application, then, it is usually necessary that a relatively small subset of dimensions be selected from a universe of potential dimensions. The only statistically desirable feature

of such a subset is the orthogonality of the dimensions so that information overlap is minimized. (Correlations of criteria with candidate dimensions are unreliable guides since they may obscure complex interactions or "functional emergents"). Other than that, one is forced to rely upon theory, knowledge of the content area, and intuition to select dimensions. This state of affairs can, of course, lead to a number of alternative typologies. Which of them would be "the best" for some particular set of purposes is a judgment that would have to be made after comparative data were obtained.

Two final limitations on extrapolation of the results of this study are that data were obtained only from students in one medical school and were confined largely to the first two years. It is possible that the constellation of findings for any given type will shift with the nature of the medical school "climate" and that different kinds of phenomena will be associated with the types in the "clinical years" of medical school and on into postgraduate training and practice. Just what these characteristics might be is a matter for empirical investigation.

CHAPTER 6

SUMMARY

In this study the medical student was conceptualized as a complex which both poses problems and offers potential solutions. The problems with which the student must deal were seen to include those of survival within the medical school system, relating to others within the world of medicine, and making choices amongst various career options. As presented to him, these problems are mostly ill-defined and require for their solution the generation and solution of sub-problems, including those of identity, the characterization of others, and the representation of professional alternatives.

The medical school environment was viewed as a pool of potential problem element representations and prototypic problem solutions. Faculty and staff were seen as presenting to the student a diverse array of learning experiences, concepts, role models, values, attitudes, personalities and the like. Since many of these are incompatible or mutually exclusive (e.g., one cannot represent certain patients as "crocks" and as individuals deserving respect at the same time), the student must choose which, if any, of the images presented he should incorporate into his own problem solving system.

It was the thesis of this study that what the medical student strives to build into his own problem solving system, and the way he builds it in, will be governed not only by that portion of medical life presented to him by his environment or by minimal requirements for graduation, but also by the general nature of the problem solving system with which he begins. That is, the person's problem solving system, to some degree, directs its own development. Thus, the foci of the present study were the contributions of pre-existing problem solving systems to the further elaboration and specification of those systems within the context of medicine.

In order to investigate this proposition empirically, several types of problem solving systems were identified on the basis of patterns of scores on five dimensions of cognitive style or "personality". The five dimensions, derived from cluster analysis of the Myers-Briggs Type Indicator and 16 Personality Factor Questionnaire, were:

1. Extraversion vs. Introversion
2. Rule-bound vs. Unconstrained
3. Feeling vs. Thinking
4. Divergence vs. Conventionality of Thought
5. Anxiety vs. Adjustment

Twelve relatively homogeneous score patterns (types) were identified in a group of medical students at the University of New Mexico School of Medicine by subjecting their scores on the five dimensions to the BC-TRY object clustering procedure.

For each of the twelve groups of "like-minded" subjects, on each of 105 continuous variables, a mean and standard deviation were calculated and compared to a distribution of 300 means or standard deviations computed from random samples of scores selected from the total pool of scores on each variable. In addition, deviation from chance occurrence was evaluated for fifteen non-continuous variables by means of the Chi-Square Test. The predicted variables included scores on several dimensions of physician ideology; scores on dimensions of expectations and perceptions of student and faculty roles; ratings of career dispositions; academic ability and achievement scores; ratings of perceived goals of the medical school; ratings of preferred methods of learning; ratings of the frequency of involvement in various kinds of leisure time pursuits; and several biographical variables.

Definite patterns of characteristics emerged for the twelve types as a result of these analyses. They were conceptualized as follows:

Type 1: Disillusioned Idealists

These students are sensitive and eager to help others and take a humanistic approach to interpersonal relations. Their preferences are for improvisation and spontaneity rather than preparation and self-restraint. They value original and innovative approaches to problems more than practical, down-to-earth ones.

Type 1 students are capable individuals who enter medical school expecting a good deal of freedom of action and "outlets" for their desires for personal growth and humanistic relatedness. After what may be an initial spurt of enthusiasm in the first year, they become disenchanted with medical school and earn poorer evaluations of their performance than would be expected on the basis of their abilities alone. The amount of subjective distress which they experience is greater than that of other medical students. In terms of specialty preferences, they appear to be headed in the direction of Internal Medicine.

Type 2: Loners

Students belonging to this type are socially shy, introspective, quiet and inhibited in self-expression. They may be bothered by feelings of inferiority or lack of self-confidence. They tend to be imaginative and intellectually curious, interested in the content of their work or study as opposed to the social or economic gains they may receive from it. The Type 2 individual is unconcerned with his social image, may be seen as "negligent" in contexts requiring attention to detail and routine, or as "adaptable" in contexts not having these constraints.

In medical school Type 2 students seem to prefer to learn on their own, don't expect much or perceive much to be offered by faculty or other students, and shy away from

the demands of social intercourse. The hypothesis can be entertained that they "solve" problems which trigger an unfavorable characterization of self (i.e., in the social interaction area) by devaluing the importance of one's "performance" in such situations. Since most medical positions require some amount of interpersonal relating, perhaps it is not too surprising that Type 2 students have not identified a specialty niche for themselves.

Type 3: People-Oriented Practitioners

These students are concerned with people, warm and sympathetic in their relations with others, sensitive, and "tender-minded." They are likely to be described as enthusiastic, spontaneous and insightful, especially in the interpersonal context. The Type 3 student values creativity and can be imaginative and innovative in circumstances where it is not required that he "keep his nose to the grindstone."

In medical school these students do not appear exceptionally bright, scholarly, or discontented with their lot. Warm and friendly relationships with others seem, for Type 3's, to be rewarding in and of themselves. They tend to seek occupational settings, and value the kinds of role behavior which would make such interaction realizable, e.g., General Practice.

Type 4: Biological Academics

Students falling into this type are practical, have good memory for detail, tend to be consistent and dependable, and are able to support their judgments with facts. Logic, planning and decisiveness are valued characteristics to these individuals. They may have difficulty in understanding others' points of view and experience some degree of subjective distress. Outwardly, they may be seen as serious, quiet and self-sufficient.

In medical school, the interests and abilities of Type 4 students seem to lie in the acquisition of concrete facts and details. This orientation is augmented by a desire for faculty directiveness in the educational process rather than a desire for "freedom of movement" or opportunities for personal expression. They would prefer to understand the facts of disease uncomplicated by psychological and social aspects or personal reactions of the physician. Their career inclinations appear to be towards the technical facets of medicine: basic science and research.

Type 5: Introverted Pragmatists

These students are similar to those in Type 4 but with less subjective distress, less emphasis on logic and impersonal judgment, and even more valuation of "concrete" reality. They are likely to be described as dependable,

persevering and responsible. Routine activities and tasks requiring attention to detail and thoroughness are easily assumed by Type 5 students. Socially they tend to be shy and introverted. Complex situations may "throw" them.

While Type 4's, with their greater thinking orientation, perform well in traditional kinds of academic tasks (e.g., National Boards) and are attracted to the academic life, Type 5's don't place as much stock in analysis and logic, tend to avoid academic life, and to invest themselves in it only to the degree of "getting by." The greater valuation of practical facts in Type 5's seems to be reflected in an even more "tough-minded" image of the physician role than in Type 4's. Their career preferences appear to be toward areas that are not too complex, don't involve a lot of "people-dealing," and are concerned with sensory facts.

Type 6: Complacent Extraverts

The outstanding characteristics of this type are its high extraversion and low anxiety scores. These students could be described as outgoing, socially poised, liking to have others around, liking external stimulation, and action oriented. While not easily disturbed by self-doubts, nor quickly upset, they may lack the motivation and patience for long complicated tasks. They tend to be interested in results rather than principles or ideas.

While not exceptionally capable intellectually, Type 6 students earn better than average evaluations in the first two years of medical school, perhaps because of their social outgoingness and desire to participate. They appear to be more satisfied with student-faculty relations than other students. Career inclinations in this group look somewhat diverse, although the hypothesis might be entertained that they prefer settings that provide regular hours and allow them freedom to engage in extra-professional activities.

Type 7: "Ideal" Students

In terms of scores on the five dimensions and number of members, this type comprises the "average" medical student at this medical school. Compared with college students in general, they are above average in intelligence, emotionally stable and self-assertive. They tend to be critical, experimenting and non-traditional in their views, preferring to make their own decisions rather than rely on group norms. Interested in art, theory, and basic beliefs, they can be quite creative while being immature in practical judgment. Generally they are of a cheerful nature.

This group of "average" medical students appeared to be average only in their image of the ideal physician. In terms of the criteria of success in the first two years of medical school they could be considered "ideal". They achieve good grades, perform exceptionally well on National Boards, Part I, do not need "structure" in their student

roles nor accommodation on the part of faculty. They are more satisfied than their peers with the amount of encouragement and support received from faculty and, one might suspect, they are more likely than other students to get it. Their career preferences reflect their academic success in the basic sciences, it would seem, perhaps with an additional constraint that "technology oriented" specialties receive low priority.

Type 8: Anxious Avoiders

The most outstanding characteristic of those students is their exceedingly high amount of acknowledged distress. Combined with their tendency toward low Rule-boundness, one would expect these individuals to experience undisciplined and unchanneled self-conflict. Depending upon circumstances, they may be anxious, self-reproaching, worrying or suspicious of the intentions of others. They are prone to guilt feelings and may be easily upset by real or imagined assults on their identities.

As far as can be determined from the predicted variables, Type 8 tendencies toward unfavorable self-characterizations are easily elicited by a number of situations and they wish to avoid them. In school, loneliness or anxiety aroused by not being able to organize themselves might be submerged by frequent outings or involvement in extracurricular activities (although this strategy might take its toll on academic performance). Type 8's seem to project their anxiety on

faculty, seeing them as not being orderly, well-organized, interesting as teachers, nor supportive and helpful as individuals. They prefer to deal with "disease" rather than the messy problems of interpersonal relations. In their career preferences, Type 8's anxiously avoid all primary care areas while focusing on highly circumscribed practice specialties.

Type 9: People Oriented Enthusiasts

These students are likely to be seen as warm, sensitive and sympathetic. They are concerned with people's feelings and are tactful, sometimes to a fault. They like the approval of others and tend to conform, within reason, to group norms. The Type 9 person may become quite enthusiastic about people he admires and may idealize them. Their high self-confidence when combined with enthusiasm about a person or idea, may lead them to jump into things without sufficient consideration. In general, however, they are conscientious in their work and clever at finding solutions to problems.

In medical school these students value enthusiasm in students and view faculty in a favorable light. Although they are high ability individuals, they do not seem motivated to put their abilities to work in the basic sciences. Warm and sensitive interpersonal relations are their forte. Type 9's are attracted to the primary care specialties and, perhaps, settings which provide opportunities for social service.

Type 10: Figures in the Community

Like Type 9, this type is primarily concerned with people, but in a more practical, materialistic way (as opposed to being interested in their "inner life" and potentialities). This kind of person is friendly, warm, talkative and cooperative in groups. He tends to be conscientious and orderly in his work and adapts well to routine. He has little capacity for abstract or novel thinking and thus may have trouble when things get complicated or require "inspiration." However, he can work diligently to master facts and details.

The definition of Type 10 students in medical school is not as clear as in some of the other types. One gets the impression from their physician ideology responses, career preference ratings and use of leisure time, that these individuals have in mind becoming "Figures in the Community" with plenty of social contacts and "surface" relationships of a pleasant nature. A career in medicine may only be a vehicle for these aspirations since they don't appear to want to assume roles which are presumably relevant to patient care (even though they score high on primary care specialties) and they are not as involved in professional groups as one would expect from extraverted, people-oriented individuals.

Type 11: Managers

Students in this type enjoy being in executive positions,

making decisions and giving orders. They value reason, planning, systematic work, order. Type 11's control their own behavior by adherence to socially-approved (often traditional) standards and are likely to pride themselves on being responsible. While socially outgoing, they may run into problems in interpersonal relations due to attempts to control others. They are interested in new ideas and complex problems and may see the long range possibilities in them.

In medical school, Type 11's score, on the one hand, in directions indicating humanistic trends: they desire more psychosocial emphasis, favor use of community resources in medical care, believe it important to inform patients about their disorders, and are inclined towards Psychiatry. On the other hand, they score on some variables in a direction indicating a certain "distancing" from others: they tend to be disease oriented and don't value informal relationships with faculty. These apparently divergent trends might be reconciled by assuming that Type 11's operate according to a definite set of rules in their interpersonal relationships, that what appear to be "tender-minded" characteristics, in reality come under the rubric of "order and efficiency" for these individuals.

Type 12: Extraverted Pragmatists

Like Type 11, members of Type 12 are socially outgoing and bound by socially acceptable codes of conduct. They

differ in being less analytical, more factually minded and oriented to practical affairs, and having a much lower level of anxiety. This last characteristic may indicate low motivation for persisting at difficult tasks -- perhaps a kind of "over satisfaction" with themselves. The Type 12 person is intellectually not very curious, nor is he an inspired thinker. His forte seems to be in the systematic organization of facts and operations that are fairly concrete in nature.

Type 12 students do poorly on National Boards, Part I, prefer the traditional lecture method of teaching, want faculty to provide structure, and think students should be enthusiastic, productive and considerate to faculty. They are generally content with medical school, except for the amount of encouragement and support they see themselves as receiving from faculty. They seem to be "traditional" also in their view of the physician role, in their career preferences, and in their uses of leisure time. The impression one receives from the data is that Type 12's would like to step into the stereotyped physician role.

This typological scheme was compared with previous typological schemes which have been proposed for medical students. It was seen to have the virtues of relatively unequivocal assignment of subjects to types, of being comprehensive, of maximizing within group differences,

and of yielding significant predictions in a number of areas relevant to medicine and medical education. Limitations and unresolved problems of the study were discussed.

This study has demonstrated that the typological approach is a fruitful one for identifying some of the regularities within the diversity presented by a medical student population. The limitations imposed by the small number of subjects in each medical school class are expected to be overcome as longitudinal data accumulates. Refinements in terms of instrumentation and types of data collected are in progress and the feasibility of adding another dimension (or dimensions) in defining types is being considered.

Perhaps most critical is the need for further elaboration and specification of the problem solving scheme. Conceptualizations, based on empirical investigation, must be developed for characterizing the kinds of problems and sub-problems with which medical students must deal. Problems must be classified and their sequencing identified. How the solution of a problem in one area provides constraints for problem solving in other areas must be considered. The different strategies and information sources which medical students use in attacking problems related to their professional identities must somehow be formalized. The whole area of the "task environment" -- the demands it places on students, the problem element representations and prototypic

problem solutions it provides, the contradictory information it dispenses and the societal influences to which it is subject -- must be dealt with in such a way as to allow prediction of its probable "state" at any given time. This is only a sampling of the numerous tasks which face the researcher. But they are necessary steps in creating a model which will anticipate, in detail, the effects on health manpower resources of any natural or planned interventions in the medical education system.

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[17]Data suggestive of this kind of phenomena in the professional socialization of nurses was presented to the authors by Hans Maukach.

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Notes and References

CHAPTER 3

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[4] Cattell, R. B., et al., op. cit.

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[10] A list of 297 references on classification recently appeared in The Classification Society Bulletin, 2, No. 3 (1971).

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Notes and References

CHAPTER 4

[1] Eighty-eight percent of the students were male, 45.8 percent were married, and of those married, 16.4 percent had children. Socio-economic information on the students' families of origin indicated a generally upper-middle class population representation. Over one half of students' fathers had completed college. Students came largely from the Rocky Mountain states and the majority came from cities of less than 99,000 population. A more detailed breakdown of biographical information on the students may be found in Graham, J. R. and Otis, G. D., Pilot Study: Medical Student and Faculty Characteristics and Interaction, Final Report to the Bureau of Health Professions Education and Manpower Training, NIH Contract 70-4093.

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[6]More detailed description of the results of the analyses performed on the 16-PF and Myers-Briggs may be found in Graham, J. R. and Otis, G. D., op. cit.

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[7]A more complete description of the SFRQ and the results of analyses performed on it with students, applicants and faculty may be found in Graham, J. R. and Otis, G. D., op. cit.

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[8]The PIQ is a shortened version of the Social Role of the Ideal Physician Questionnaire (SRIP). For more detail regarding the questionnaire, the source mentioned in notes 6 and 7 may be consulted. Cluster scores for both the SFRQ and PIQ are in standard score format, i.e., with a mean of 50 and a standard deviation of ten.

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[9]Scores for the individual career rating variables are in raw score form while those for the five career rating clusters are in standard score format.

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[10]Clinical Science I is a first year course focusing on patient interviewing and physical diagnosis. Clinical Science II, in the second year, emphasizes medical history taking, physical examination, approaches to the solution of patient problems, the hospital environment and interdisciplinary problems in preparation for clinical rotations in years 3 and 4.

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[11]Medical Biology I is an interdisciplinary, organ-system approach to the basic medical sciences and includes material from Anatomy, Biochemistry, Physiology, Microbiology, Pathology and Pharmacology. Medical Biology II follows in the second year with an emphasis on biological principles as related to clinical aspects of disease in human beings.

Notes and References

CHAPTER 5

[1] Results for the biographical variables, since they are few and based on small Ns in many cases, are presented as notes.

[2] The level of educational attainment of fathers of Type 2 students was significantly higher than that for fathers of students in general ($p = .050$).

[3] Fathers of Type 3 students tended ($p = .093$) to be of lower educational status than fathers of students in general.

[4] Fathers of Type 4 students were significantly higher in attained level of education than fathers of students taken as a whole ($p = .020$). Their mothers, however, were of significantly lower occupational status than mothers of students in general ($p = .013$).

[5] Fathers of Type 5 students showed a trend ($p = .093$) toward higher educational achievement than most fathers of students.

[6] Between ages 14 and 18, Type 8 students were more likely to have lived in small towns ($x^2 = 7.46$, $p = .05$) than other students. Their mothers were found to be more likely to have worked in a medical field ($x^2 = 5.36$, $p = .05$).

[7] Between ages 8 and 13, Type 9 students were more likely to have lived in large cities ($x^2 = 8.26$, $p = .02$) than other students. They were also found to be more likely to have been the middle of four or more children ($x^2 = 16.02$, $p = .01$).

[8] Type 11 fathers of students tended ($p = .060$) to be of lower educational level and mothers of Type 11 students tended to be of higher occupational status ($p = .080$) than their respective counterparts of students in general.

[9] Fathers of Type 12 students tended to be of higher educational level ($p = .080$) and higher occupational status ($p = .083$) than fathers of students in general.

[10] Myers, I. B. and Davis, J. A., op. cit.

[11] The usual Myers-Briggs scoring procedure involves obtaining a "preference score" by subtracting the score on one member of a pair of scores (e.g., E) from the other (e.g., I). An individual is categorized by the directions of his preferences on the four pairs of scales. Because the magnitude of most preferences is not large, minor changes can result in a categorical change for many individuals. Test-retest data from the present pool of subjects demonstrates this fact. Scores were obtained in the present study by a joint cluster analysis of the individual 16-PF and Myers-Briggs scales. Thus, for example, an individual was seen as occupying a position along a dimension of introversion-extraversion.

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[15] These correlations were in the order of .70.

List of Variables for Summary Tables

V 1	Ideal Student Role (R)
V 2	Academic vs. Clinical Orientation (low score = academic)
V 3	Psychosociocultural Sensitivity (R)
V 4	Faculty Professional Activity (R)
V 5	Faculty Accommodation (R)
V 6	Desire for Informal Relations with Faculty (R)
V 7	Division of Responsibility in Teaching (low score = faculty)
V 8	Desire for Structure (R)
V 9	Ideal Teacher Role Enactment (R)
V10	Perceived Division of Influence in Education (low score = faculty)
V11	Perceived Psychosocial Emphasis (R)
V12	Perceived Faculty Considerateness to Patients (R)
V13	Perceived Faculty Socio-emotional Role Enactment (R)
V14	Perceived Emphasis on Student Personal Development (R)
V15	Perceived Theoretical - Research Emphasis (R)
V16	Perceived Faculty Provision of Structure (R)
V17	Faculty Socio-emotional Role Enactment
V18	Psychosocial Emphasis
V19	Student vs. Faculty Influence (low score = students too much)
V20	Community Emphasis (R)
V21	Faculty Teaching Efficiency
V22	Faculty Considerateness to Patients
V23	Involvement in Extracurricular Affairs
V24	Student Personal Development
V25	Nurse vs. Physician Responsibility for Information Exchange (low score = physician)
V26	Community Orientation (R)
V27	Empathy and Rapport with Patients (R)
V28	Nurse Housekeeping Role (low score = physician)
V29	Patient Knowledge of Diagnosis (R)
V30	Psychological Healer Role (R)
V31	Psychosocial Orientation (R)
V32	Disease Orientation (R)
V33	Physician Authority
V34	Anesthesiology
V35	Basic Medical Science
V36	Dermatology
V37	Epidemiology, Community Medicine, Public Health
V38	Family Medicine, General Practice
V39	Internal Medicine
V40	Obstetrics - Gynecology
V41	Orthopedics
V42	Ophthalmology
V43	Otorhinolaryngology
V44	Pediatrics
V45	Psychiatry
V46	Radiology

List of Variables for Summary Tables

(Cont.)

V47	Pathology
V48	Surgery
V49	Private Practice, Solo
V50	Private Practice, Group
V51	Public Institution or Agency
V52	Private Institution or Agency
V53	Research
V54	Education
V55	Referral Specialties Cluster
V56	Research/Education Cluster
V57	Institutional Practice Cluster
V58	Surgery Cluster
V59	Primary Care Cluster
V60	MCAT Verbal
V61	MCAT Quantitative
V62	MCAT General Information
V63	MCAT Science
V64	MCAT Average
V65	Undergraduate GPA
V66	Success Score Yr. I
V67	Clinical Science I
V68	Medical Biology I
V69	Success Score Yr. II
V70	Clinical Science II
V71	Medical Biology II
V72	Boards Anatomy
V73	Boards Physiology
V74	Boards Biochemistry
V75	Boards Pathology
V76	Boards Microbiology
V77	Boards Pharmacology
V78	Develop Clinicians
V79	Develop Researchers
V80	Develop Administrators
V81	Develop Teachers
V82	Didactic Lectures (student led) on entry (R)
V83	Didactic Lectures (student led) current (R)
V84	Didactic Lectures (instructor led) on entry (R)
V85	Didactic Lectures (instructor led) current (R)
V86	Group discussion (student led) on entry (R)
V87	Group discussion (student led) current (R)
V88	Group discussion (instructor led) on entry (R)
V89	Group discussion (instructor led) current (R)
V90	Independent study projects on entry (R)
V91	Independent study projects current (R)
V92	Clinical rounds and conferences on entry (R)
V93	Clinical rounds and conferences current (R)

List of Variables for Summary Tables
(Cont.)

V 94	Tutorials on entry (R)
V 95	Tutorials Current (R)
V 96	Task-Oriented Groups (R)
V 97	Structured Recreational Groups (R)
V 98	Professional Groups (R)
V 99	Individual or Solitary activity (R)
V100	Informal or unstructured outings (R)
V101	Recreation with Family (R)
V102	Father's Occupational Status
V103	Mother's Occupational Status
V104	Father's Educational Level
V105	Mother's Educational Level